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Small Arms Training

Volume I, Pamphlet No. 1

Weapon Training

1937

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By Command of the Army Council,

A. J. G. G.

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SECTION 1.—PRINCIPLES AND SYSTEM OF TRAINING

General

1. Skill in the use of weapons, individually by the soldier and in combination by leaders, is one of the first essentials for victory in battle. Small Arms Training shows a system of teaching which, if followed, not slavishly in the letter but in principle with common sense, will produce this skill. It consists of two volumes.

Volume I deals with all small arms weapons; particulars concerning training in them; the application of their fire against the enemy on the ground and in the air. It consists of a series of pamphlets numbered and titled as follows :—

- No. 1. Weapon Training.
- No. 2. Application of Fire.
- No. 3. Rifle.
- No. 4. Light Machine Gun.
- No. 5. Anti-Tank Rifle.
- No. 6. Anti-Aircraft.
- No. 7. Machine Gun (in three parts).
- No. 8. Mortar (2-inch).
- No. 9. Mortar (3-inch).
- No. 10. Infantry range-finder.
- No. 11. Pistol (.38-inch).
- No. 12. Bayonet.
- No. 13. Grenade.
- No. 14. }
- No. 15. } Range Courses—All Arms.
- No. 16. }
- No. 17. }
- No. 18. Range Courses (War).
- No. 18 (Supplement). Anti-Tank Rifle Course.
- No. 19. Anti-Tank Gun.
- No. 20. .303-inch Lewis Machine Gun.
- No. 21. Thompson Sub-Machine Gun.

Volume V contains details regarding the construction and maintenance of ranges and apparatus for weapon training.

2. Four conditions are essential to the production of effective fire from small arms in battle :—

- i. A high standard of individual skill in the use of weapons and in judging distance or range-taking.

- ii. The co-operation of skilled individuals to form an effective fire unit under a leader.
- iii. Ability on the part of platoon and higher commanders to direct fire to the best advantage.
- iv. Ability on the part of fire unit commanders to control the fire of their units and on the part of the men to recognize the target.

3. The object of weapon training, therefore, is :—

- i. To make the man proficient in handling and firing his weapons so as to give him confidence in them and in his capacity to use them effectively in battle.
- ii. To train men to work together in a fire unit under a commander.
- iii. To ensure that commanders are competent to train their men and are themselves proficient in fire control.
- iv. To provide instructors who are capable of producing the above.

Note.—Where necessary, "regiment", "squadron", "battery" or "troop", etc., should be read for "battalion", "company" and "platoon". Where applicable, the term "machine gun" includes the light and Vickers machine gun.

4. A fully qualified instructor should be able :—

- i. To train recruits or men who possess little or no knowledge of a particular weapon.
- ii. To exercise trained men.
- iii. To train junior commanders in fire direction and control.
- iv. To train officers, warrant officers and N.C.Os. to be instructors.

5. No individual can be considered fully trained unless he is able to use efficiently any of the weapons with which he may be armed, and particularly when wearing a respirator. To ensure this, frequent practice is necessary, and weapon training of the leader and soldier should take place throughout the year.

6. Boys may be trained in the use of weapons at the discretion of their commanding officer, and, if physically fit, may fire the recruit course during the last six months of boys' service.

7. Sufficient mechanism required for the care and maintenance of weapons is included in this book. Further knowledge if required may be obtained from the Text Book of Small Arms and from instructions in the possession of unit armourers.

Weapon Training Year

8. For the purpose of firing the annual courses and accounting for practice ammunition, the weapon training period will be divided into years. The date on which the weapon training year begins at any station is dictated by the climatic conditions at that station. These dates are given below :—

South China	1st September.
At Home and in Palestine	1st November.
Gibraltar, Mauritius, North China	1st January.
Ceylon	1st February.
Bermuda, Cyprus, Egypt, Sudan, Jamaica, Malta, Malaya, India and Burma	1st April.

(May be varied by G.Os.C.-in-C. to suit local conditions.)

9. In principle, each man should fire one annual course each year, and ammunition can only be drawn for one course each weapon training year.

If, therefore, a unit, when it moves to a new station, has not finished firing its annual course, the course will be fired or completed at the new station, provided that there is time to do so before the next weapon training year begins at that station (*see* Equipment Regulations, Part I, 1932, para. 181).

10. The weapon training year, however, for a unit going from England on foreign service will be held to begin in the foreign station to which the unit is going; thus a unit leaving England in January for Egypt will begin its weapon training year on 1st April and will not expend any ammunition at home after 31st October.

11. At the beginning of a new weapon training year any unexpended ammunition in respect of the past weapon training year will lapse. If, therefore, on the arrival of a unit at a new station, the next weapon training year at that station has already begun, or there is no time to fire before it does begin, the annual course for the previous year will not be completed.

12. If there is an interval between the arrival of a unit at a new station and the date on which the next weapon training year begins at that station, the unit may, subject to the approval of the G.O.C.-in-C., begin its annual course for the following year before the date on which it actually becomes due to begin firing another course. Such training will, however, be included in the returns for the weapon training year in which the training should have been carried out.

13. The instructions in paragraphs 9 to 12 above also apply to individuals changing stations.

Safety Precautions during Training

14. The detailed safety precautions necessary during training, especially when ammunition is used, are laid down in this pamphlet. Any building that contains explosives should be considered as an explosive store and be dealt with as far as possible in accordance with Magazine Regulations.

15. Dummy cartridges are employed in training and are essential for efficiency. There is, however, a risk of accidents through their becoming mixed with live ammunition. To prevent accidents, inspections will be carried out at the beginning of each lesson. Instructors will:—

- i. Inspect all weapons.
- ii. Inspect all ammunition pouches, M.G. belts and boxes, magazines and carriers to ensure that no live ammunition is present.
- iii. Inspect all dummies.
- iv. Show their own weapons and dummies to the squad under their instruction.
- v. Inspect grenades and grenade stores and order the first safety precaution to be carried out in grenade training.

Dummies will never be used in aiming at an aiming disc held to the eye.

When dummy cartridges are used for setting up stoppages with automatic weapons on the range, officers conducting the practice will supervise their issue and subsequent collection.

16. Storage of ammunition.—Ammunition should be kept perfectly dry and clean and should not be exposed to extremes of temperature. In no circumstances will dummy cartridges be kept in, or issued from, the same store as that used for ball or blank ammunition.

17. No cartridges, other than those supplied by the R.A.O.C., will be used in service weapons.

Principles of Instruction

18. Instruction will be given, when practicable, in the following sequence:—

Explanation ...	... Instruction by the ear.
Demonstration ...	... Instruction by the eye.
Execution ...	... Imitation of the demonstration and correcting mistakes.
Repetition ...	... Practice to improve.

Execution should follow demonstration as soon as possible so that the lesson is more readily impressed on the mind of the soldier.

Accuracy and speed in execution should be obtained gradually by repetition until men are able to handle their weapons by sense of touch alone.

19. A good instructor requires the following:—

- i. Common sense and enthusiasm.
- ii. Sympathy with and interest in those under instruction and an understanding of their outlook.
- iii. Knowledge of his subject.
- iv. A clear idea beforehand of the lessons to be taught and the method of teaching them.
- v. The ability to encourage by praise where praise is due and to avoid sarcasm.
- vi. The ability to use his own words rather than a repetition of the words in the book.

Hints to Instructors

20. No method of instructing will be effective unless it possesses simplicity and interest. The following are a few general hints to instructors:—

- i. However experienced he may be, preparation of the next day's work is essential and the necessary stores must be placed ready for use before the beginning of each lesson.
- ii. The interest of the men must be roused and maintained. Variety of subjects assists, but apart from this much depends on an instructor's manner. He should be brief and keep to the point, avoiding non-essentials. Competition stimulates keenness and team spirit, but the tendency to sacrifice accuracy for speed must be guarded against.
- iii. He will be careful to avoid personal mannerisms which distract the attention of a squad. He must learn to speak quietly, slowly and distinctly, and avoid either a monotonous tone of voice or shouting.
- iv. In giving demonstrations, he must be accurate in his movements.
- v. Questions and answers develop quickness of thought and ease of expression. This applies particularly to subjects where only one weapon is available for the whole squad. Questions should be addressed to the whole squad and not to one particular individual; then, after a sufficient pause, one man should be asked for the answer. A regular sequence of

questioning should be avoided. Thus the whole squad will have to consider the answer and be kept on the alert.

- vi. He must expect and look for mistakes. Encouragement should follow correction. In correcting faults, he should make a man correct himself. A brief demonstration of the fault and interrogation afterwards are valuable means of bringing it home to the man. Faults due to slackness or neglect should be dealt with firmly, but criticism after an honest effort must be such as will produce a further and better effort. Good work should always be acknowledged.
- vii. He will give a brief explanation of what he is about to teach at the beginning of each lesson, and when a new subject is introduced.
- viii. Where a single weapon (i.e. L.M.G. and A.T. rifle) is used, a table is desirable, and the squad will be seated where they can best see the action.
- ix. One of his most important duties is to be able to coach a firer on the range. For this work patience and practical experience are necessary, combined with a sympathetic study of each individual's abilities. Details of the method of coaching will be found in Appendix II.

21. Every N.C.O. and man will be in possession of a record book (A.B. 142) suitable to his weapon training category. These books will be issued to recruits as soon as their weapon training begins (Pamphlet No. 3, Lesson 1). They must be carefully preserved and kept up and will be brought on all weapon training parades or when firing on the range takes place.

Tests of Elementary Training

22. Advanced weapon training and range practices are a waste of time and ammunition unless those taking part have reached a certain standard of efficiency.

The tests of elementary training give the required standard. They are designed to :—

- i. Ensure that recruits have reached an efficient standard before they begin range practices.
- ii. Ensure that trained soldiers are efficient.
- iii. Provide a standard which the Territorial Army and technical troops should aim at reaching according to the time available for training.
- iv. Prevent any detail of elementary training being overlooked.

- v. Enable officers charged with the preparation of individual training programmes to determine what proportion of the time available should be allotted to the various subjects.

23. A record of the results of individual tests will be kept by company commanders and inspected periodically by unit commanders.

24. Extracts from the record of tests will always be furnished by the company commanders concerned when a soldier is transferred from one company to another. In addition, all soldiers will have a record of their performances kept for them in their record books.

25. At the beginning of individual training, records will be examined to see which subjects require most practice. Where no records exist, men should be tested and the programme made out on the results of the tests. Towards the end of the training, tests should again be carried out to ascertain the progress made.

26. It is important that teaching should not be confused with testing. In the former, men are instructed by explanation and demonstration, followed by execution; in the latter, men are questioned or ordered to carry out a certain test, after due warning, without assistance and they either pass or are put back for further instruction. The conditions of each test will be explained to individuals or sections before it is carried out.

27. The conditions of the various tests of elementary training are given in the pamphlets for each weapon and in the record book (A.B. 142). The person conducting the test will enter the result at the conclusion of each test in the presence of the individual tested.

Owing to the limited time available for training, post-mobilization recruits will not generally be able to carry out these tests.

Preparation of Programmes

28. Progressive instruction is ensured only by means of programmes which require careful consideration in their preparation.

29. Programmes may be required with one of the following objects in view :—

- i. Recruit training at the depot.
- ii. Post-depot weapon training.
- iii. To exercise the trained soldier.

- iv. To train instructors (section leaders, depot or Territorial Army).
- v. To refresh instructors.
- vi. To prepare officers and N.C.Os. for a course at the Small Arms School.

30. When preparing a programme, the officer concerned should consider the following :—

- i. The commanding officer's policy.
- ii. The number of working days available and whether the instruction will be continuous or interrupted; the hours of work each day and the time of year.
- iii. The number of periods required to carry out the syllabus and the daily allocation of periods.
- iv. The number of instructors available and the number of men under instruction. The strength of squads should not exceed eight.
- v. The standard of knowledge of the men to be instructed.
- vi. The places of work and type of ground available. These must be considered from the point of view of both fine and wet weather.
- vii. The equipment and stores available and required for instruction.

31. The officer, having decided on the object of the course and considered the above points, should :—

- i. Make a list of subjects to be taught, i.e. a syllabus.
- ii. Arrange subjects and lessons in logical sequence.
- iii. Group subjects together in the syllabus and allot periods.
- iv. Allot time for practice and mutual instruction in such subjects as require it.
- v. Allot time for tests and examinations (if necessary).

32. Lessons should be taught in the sequence shown in the syllabus and should be clearly numbered in the programme so that it is obvious to both instructor and student which lessons are to be taught.

33. It is advisable to prepare a complete programme for the whole course of instruction, which should then be sub-divided into weekly and daily programmes. The weekly programme should be issued during the previous week to enable instructors to prepare the work. The daily programme should be suitably arranged for both dry and wet weather; it will often be advisable to have alternative programmes.

34. The following are a few general hints to be considered in preparing programmes :—

- i. Variation of the subject maintains interest and dispels monotony.
- ii. Arrange subjects so that those under instruction have alternately a difficult and easy period.
- iii. Start the day with a vigorous subject, such as bayonet training.
- iv. Allow time for movement from places of work.
- v. Arrange for a " break " during the morning's work.
- vi. If possible, lectures should take place in the evening, particularly in winter.

A N.C.O. should be made responsible for the preparation and arrangement of the equipment and apparatus required for the day's instruction (*see* para. 30, vii, above). He should be provided with copies of all programmes and informed of any alterations.

35. A period of instruction should not exceed 45 minutes. All lessons have been designed so that they can be completed in this time, but many will require repetition.

Sequence of Training

War Office letter No. 43/Infantry/446 (M.T.2) dated 29th June, 1938, contains a revised syllabus which is for trial and report. Paragraphs 36 and 37 are, therefore, in abeyance until further instructions are issued.

36. Weapon training for the recruit is divided into two parts, as follows :—

- Part I—Recruit depot weapon training, requiring 92 hours' instruction.
- „ II—Recruit post-depot weapon training, requiring 60 hours' instruction.

37. The allotment of hours and the sequence of instruction for rifle battalions in each part is as follows :—

Part I.—Recruit Depot Weapon Training

Allotments of hours to subjects :—

	Hours		Hours
Mechanism and cleaning	4	Demonstration theory	2
Aiming instruction ...	7	Miniature range ...	10
Firing instruction ...	8	30-yard and open range	12
Bayonet training ...	6	L.M.G. instruction ...	11
Application of fire ...	14	L.M.G. range work ...	6
Fire discipline training	2	T.O.E.T. ...	10

Sequence of instruction :—

Pamphlet	Lesson	Subject
Rifle	1	Mechanism and trigger pressing.
"	2	Cleaning materials and daily cleaning.
"	3	Loading and unloading.
"	6	Accuracy of aim.
"	13	Lying position.
"	14	" "

THE RECRUIT IS NOW READY TO FIRE ON THE MINIATURE RANGE

Pamphlet	Lesson	Subject
Rifle	7	Aiming at service distances.
Application of Fire	1	Military vocabulary.
" " "	9	Judging distance—Unit of measure.
Rifle	8	Aiming at ground.
"	15	Kneeling position.
"	9	Aiming off for wind (elementary).*
"	16	Sitting and standing positions.
"	17	Snapshooting.
Application of Fire	2	Methods of searching ground.
" " "	10	Judging distance—Appearance method.
Bayonet	1	On-guard, high port and controlled charge.
Rifle	4	Cleaning before and after firing.

THE RECRUIT IS NOW READY TO FIRE ON THE 30-YARD RANGE
(Instruction in the L.M.G. may now be included in the programme)

Pamphlet	Lesson	Subject
Rifle	10	Elevation—Aiming up or down.
Application of Fire	3	Locating service targets.
Bayonet	2	The point.
Rifle	11	Aiming off for wind, service targets.
"	12	Aiming off for movement.
"	18	Snapshooting (collective).
"	19	Rapid firing.
Theory		Demonstration.†
Rifle	20	Lying position (cover).
Application of Fire	4	Study of ground.
Bayonet	3	Two points.
Rifle	21	Kneeling position (cover).
Application of Fire	5	Recognition—Easy targets.
Rifle	22	Standing position (cover).
Application of Fire	11	Judging distance—Aids.
Rifle	23	Fire discipline training (individual).
Application of Fire	6	Recognition—Difficult targets.
Bayonet	4	The training stick.
Application of Fire	7	Measurement of degrees.
" " "	8	Combination of methods.
Bayonet	5	Self-defence.
"	6	Assault practice.
Application of Fire	14	Fire control orders, normal, concentrated.
" " "	15	Fire control orders, normal, distributed.
" " "	16	Fire control orders, brief, anticipatory and snapshooting.
Rifle	24	Fire discipline training (section).‡

* Not taught to the post-mobilization recruit.

† See Sec. 2, para. 3, of this pamphlet.

‡ Repeat, if possible, in collective training.

Light machine gun

Training should start early to provide variation to the rifle in the daily programme.

Pamphlet	Lesson	Subject
Light Machine Gun	1	Introduction and magazine filling.
" " "	2	Loading, unloading and sight setting.
" " "	3	Holding and aiming.
" " "	4	Firing.
" " "	5	Piston group.
" " "	6	Barrel and butt group.
" " "	7	Body group and bipod.
" " "	8	Care and cleaning (daily and before firing).
" " "	9	Cleaning during intervals of firing and after firing.
" " "	10	Mechanism.
" " "	13	Immediate action.

THE RECRUIT IS NOW READY TO FIRE ON THE 30-YARD RANGE WITH THE L.M.G.

Range work :

The range courses as laid down for the rifle and L.M.G. will be fired on the miniature, 30-yards and open ranges.

PART II.—Recruit Post-Depot Weapon Training

Allotment of hours :—

	Hours	
Rifle	6	For revision
Bayonet	3	" "
Application of fire ...	6	" "
Light machine gun ...	22	Revision and teaching new lessons
Anti-aircraft training ...	10	Teaching new subject
Anti-tank rifle	4	" " "
Grenade	9	" " "

Note : Pistol.—An additional allotment of seven hours should be given to teach those armed with this weapon.*Syllabus :—*

Pamphlet	Lesson	Remarks
Rifle	1 to 24	Recruits should not require to be taught these lessons again, but Pamphlet No. 3, Rifle, Lesson 4, Cleaning after Gas Attack, must be completed. A careful scrutiny of the records of tests of elementary training will show weaknesses and the need to repeat certain lessons.
Bayonet	1 to 6	Repetition of certain lessons should be included in order to make variety in the programme.

Pamphlet	Lesson	Remarks
Application of Fire	1 to 16	Use should be made of landscape targets and harmonized sights.
Light Machine Gun	1 to 10	Repetition as necessary, to refresh the recruit in the instruction given at the depot.
" " "	11 to 26	The recruit will require to be "taught" these lessons. Training for those armed with the pistol may be introduced to enable a variation in the programme to be made.
Anti-Aircraft	1 to 10	Lesson 8 should not be taught until the soldier has received instruction in Lesson 20, L.M.G.
Anti-Tank Rifle	1 to 4	
Grenade	1 to 9	Instruction can be spread throughout the programme. Firing instruction should be introduced after practice in firing the rifle behind cover.
* Pistol	1 to 5	This subject will only be taught to those armed with the pistol and has, therefore, not been included in the general allotment of hours. Two hours have been allotted for firing the grouping practices.

Exercising the Trained Soldier

38. In exercising the trained soldier, the method adopted for recruit instruction will be modified, and the system employed will be that of practising the soldier in the use of his weapons, rather than teaching him.

39. The squadron or company commander should endeavour to ensure that the programmes are so arranged that all the men are being practised in subjects in which they require to maintain their standard of efficiency. N.C.Os. and men who have proved themselves efficient will not carry out unnecessary repetitions, but will be instructed in more advanced subjects. The instructor carrying out the programme must avoid detail, except in the case of backward men whom it may be necessary to "teach" in those subjects in which they are below standard.

40. The following special points should be considered in preparing programmes for trained soldiers:—

i. The object may be:—

(a) Preparation for the passing of tests of elementary training.

* Range work:

Time should be allotted in addition to the 60 hours for firing the courses laid down for rifle, L.M.G., pistol and the A.Tk. rifle.

(b) Improving any weakness shown in tests of elementary training.

(c) Preparation for the annual range course.

ii. That the individuals who are to be exercised are trained soldiers and, therefore, do not require detailed instruction; they need only to be practised and refreshed in those subjects which have a direct bearing on the object for which the programme is designed.

iii. Maintain interest and avoid monotony by variation of the subjects.

iv. Frame the programme so that exercises which require physical exertion alternate with those of a less strenuous nature.

41. Four specimen programmes are given below, as examples. These by no means deal with the full range of subjects.

Object.—Preparation for tests of elementary training.

Stores:—Training sticks, aiming rests, landscape targets. Representative targets, small, large and snapshooting.

Detail:—

10 minutes	Bayonet training	Points, using training stick
5 "	Mechanism and cleaning	Questions on care and general knowledge
10 "	Aiming	Accuracy of aim at small and large representative targets
10 "	Recognition	Landscape targets. Points described, and men aim
10 "	Snapshooting and rapid firing	Timed exposures at representative small and snapshooting targets

Object.—Preparation for firing annual range course.

Stores:—Representative targets, small, large and snapshooting. Suitable cover.

Detail:—

10 minutes	A.A.F.D.T.	
5 "	Aiming	Question on points of aim for various winds
5 "	Firing instruction	Positions behind cover
10 "	Snapshooting and rapid firing	Standing behind cover. Timed. 10 rounds in 45 seconds
5 "	Cleaning	Questions on cleaning, including after gas, before and after firing
10 "	Fire and manoeuvre	Short rushes, getting up and down quickly, firing after each rush

Object.—Preparation for field firing.

Stores :—*Aiming rests, signal flag. (Also, fatiguemen.)*

Detail :—

10 minutes	Aiming	Aiming at ground and aiming off for movement. Wearing respirators.
10 "	F.D.T.	Lesson 23, Pamphlet No. 3
5 "	Recognition	Questions on all types of fire orders
10 "	Judging distance	At objects up to 800 yards
10 "	Fire and manoeuvre	Short advances and occupation of positions

Note.—Careful preparation and rehearsal of fatiguemen will be necessary before the above programme is carried out.

Object.—General (Rifle, grenade, A.Tk. rifle and L.M.G.).

Stores :—*Four model planes on poles. E.Y. rifles, dischargers, ballistite, dummy grenades. (Also, four fatiguemen.)*

Detail :—

10 minutes	A.A.F.D.T.	"Aircraft action," wearing the respirator.
5 "	Light machine gun	Question on L.M.G. general knowledge
15 "	Grenade firing	Changing from rifleman to rifle bomber firing dummy grenades
5 "	A.Tk. rifle	Questions on care and cleaning, aiming and firing
10 "	A.Tk. rifle (handling)	Selection of firing positions

Note.—Careful arrangement of stores and selection of ground will be necessary beforehand.

Object.—General (Rifle, grenade and L.M.G.).

Stores :—*L.M.Gs. magazines and equipment. Aiming rests, training sticks, smoke grenades.*

Detail :—

10 minutes	F.D.T.	Short advances and occupation of positions
5 "	Aiming	Questions on aiming off for wind, movement and elevation
10 "	Section handling (L.M.G.)	Men changing numbers. Ammunition supply, wearing respirators
5 "	Visual training	Question on methods of searching ground. Features of military importance
10 "	Grenade	Use of smoke
5 "	Bayonet training	Practice with the training stick.

SECTION 2.—THE THEORY OF SMALL ARMS FIRE

General

1. In order to obtain the full fire effect from the weapons with which they are armed, it is necessary for all ranks to have a working knowledge of the theory of small arms fire. Those wishing to study the subject in further detail should consult the Text Book of Small Arms.

2. This section has been divided into two parts, dealing in Part 1 with the elementary theory of the fire of a single rifle and in Part 2 with the theory of the fire of an automatic weapon.

3. The following demonstrations, using tracer, should be given to the soldier in explanation of Part 1 :—

- Trajectory of the bullet at various ranges.
- Necessity for sight adjustment.
- Effect of wind.

The contents of Part 2 should be studied by all officers and fire unit leaders.

Part 1.—Elementary Theory (Rifle)

4. Description of Mark VII ammunition, cartridge and bullet.—The cartridge case is of solid drawn brass and has a rim at the base by which the cartridge is positioned in the chamber and extracted.

- It contains the propellant charge.
- Sealing of the chamber is effected by the expansion of the walls of the case on firing.
- It carries the means of ignition.

The bullet is pointed and has a lead core enclosed in a cupro-nickel envelope. The advantage of the elongated bullet is that it has greater weight in proportion to the surface directly

opposed to the air and is, therefore, better able to overcome the resistance of the air; thus its velocity is assisted and greater range and striking power obtained.

5. Rifling.—A barrel is said to be rifled when it has spiral grooves cut down the bore (see Fig. 1).

6. When a weapon is fired, certain factors, which are explained below, at once begin to act on the bullet.

i. Before the bullet leaves the barrel.

(a) Force of explosion.—When a round of ammunition is fired, the gases formed by the burning of the charge pushed the bullet forward through the bore

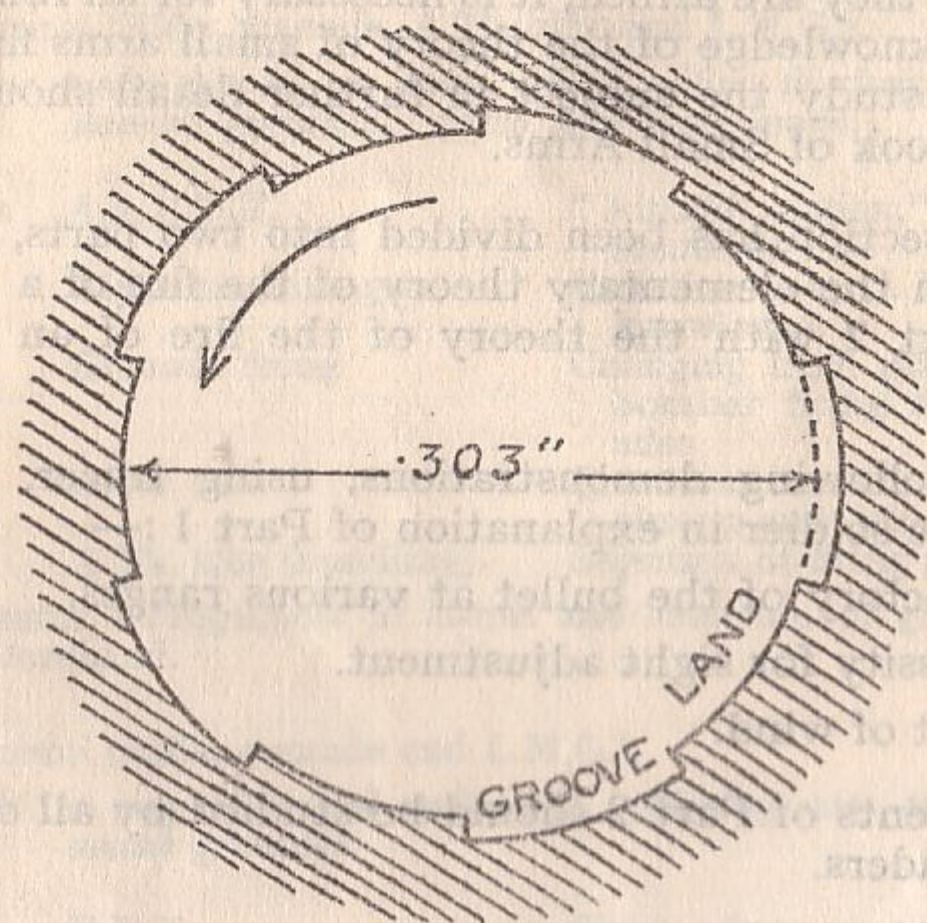


FIG. 1.

to the muzzle, and out into the air. With Mark VII ammunition the velocity with which the bullet leaves the muzzle is 2,440 feet a second. With A.T. rifle ammunition it is about 2,600 feet a second.

(b) Rifling.—When the charge is fired, the bullet is forced against the grooves along the barrel and, consequently, when it leaves the muzzle, it has acquired a spinning motion. This tends to keep the nose foremost and to ensure steadiness in flight, with resultant accuracy. This spinning also enables an elongated bullet to be used.

(c) Movement due to recoil.—When the weapon is

fired, the explosion, together with the bullet forcing its way through the barrel, sets up a vibratory movement which may result in a difference between the prolongation of the axis of the bore before firing and the line of departure to the bullet. This difference expressed as an angle is known as "jump" and is compensated for by adjustment of the foresight before the rifle leaves the factory.

(d) Oily barrel.—If shots are fired with an oily barrel, abnormal vibration and consequently erratic shooting will occur until the oil is burnt up.

(e) Oily cartridge.—Should the chamber or cartridge be oily or wet, extra back-pressure will be developed on the bolt head, breech block or lock owing to lack of friction between the case and the chamber. This will affect vibration and erratic shooting will result.

(f) Stocking up of the rifle, i.e. the fitting of the fore-end to the barrel and body.—This is most carefully done at the factory. Any warping of the fore-end or loosening of screws, or the presence of any foreign body between the fore-end and the barrel, may affect the jump and thereby affect the shooting of the rifle.

(g) Effect of firing with the bayonet fixed.—The weight of the bayonet may affect the jump and the shooting of the rifle.

Normally with Mark VII ammunition the jump is upwards, and allowance has to be made, but no two rifles shoot exactly alike. As a rough guide, a bullet fired from the average rifle with a bayonet fixed at 300 yards range strikes the target about 1 foot above the point which it would have struck had the bayonet not been fixed.

In every case the man must ascertain the shooting of his rifle.

(h) Resting the rifle.—This may affect the jump. The effect will be reduced to a minimum when the rifle is rested at the point of balance.

ii. After the bullet leaves the barrel.

(a) Resistance of the air.—This causes the velocity of the bullet to decrease rapidly and allows it to travel only about 600 yards in the first second, about 400 yards in the second second, and about 300 yards in the third second.

(b) Gravity.—This acts on the bullet immediately it leaves the muzzle, drawing it downwards with increasing speed.

These two factors cause the bullet to travel in a curved path, the fall of the bullet becoming steeper as the range increases.

Definitions

7. The axis of the barrel is an imaginary line following the centre of the bore from breech to muzzle.

The line of departure is the direction which the bullet takes on leaving the muzzle. Theoretically this is in prolongation of the axis of the barrel, but generally it differs from this by an amount depending on the jump.

The line of fire is the direction of the target from the muzzle of a weapon.

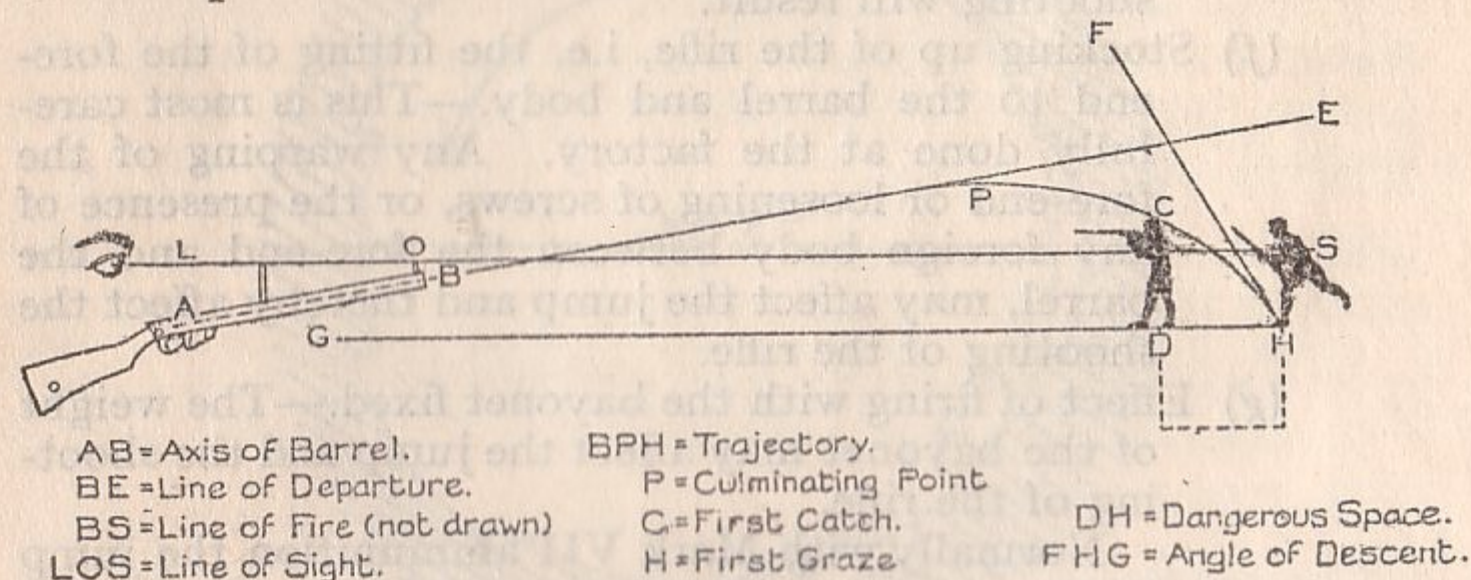


FIG. 2.

The line of sight is a straight line from the firer's eye, through the sights, to the point aimed at.

The trajectory is the curved path taken by a bullet during its flight (see Appendix I).

The culminating point is the greatest height above the line of sight to which the bullet rises in its flight; this occurs a little beyond half the distance which the bullet travels (see Appendix I).

The angle of descent is the angle which the tangent to the trajectory makes with the line of sight at the point of impact.

Ricochets.—Bullets which rebound after striking the ground or any other obstacle and continue their flight are said to ricochet. Ricochets may occur from any surface, but are less likely from soft ground than from hard smooth surfaces; bullets ricochet freely from water, and from any surface may

rise abruptly or deviate considerably to right or left from their original course.

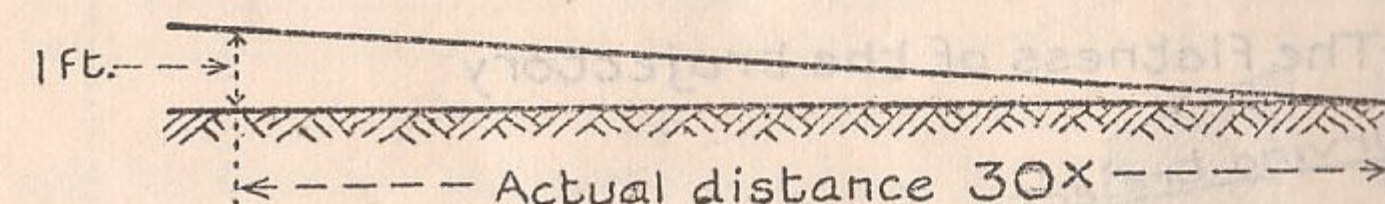
The first catch is the point where the bullet has descended sufficiently to strike the top of the target.

The first graze is the point where the bullet, if not interfered with, will first strike the ground.

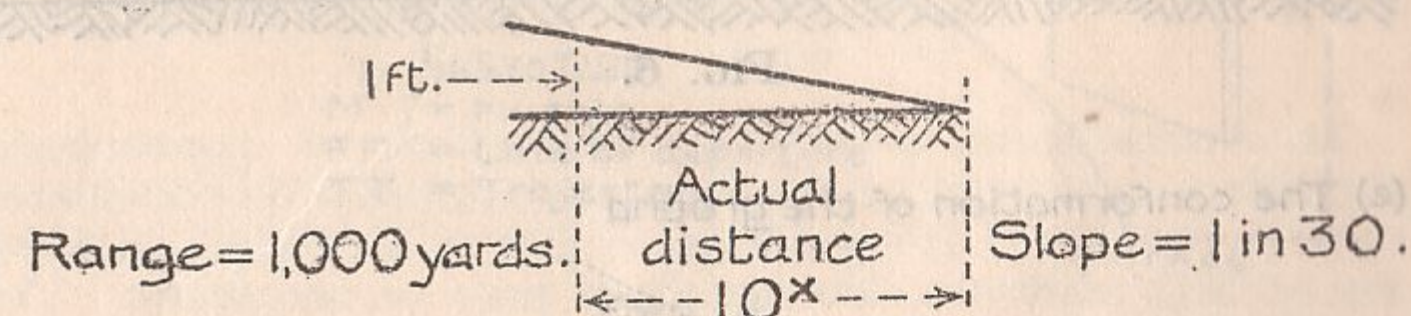
The dangerous space for any particular range is the distance between the first catch and the first graze. The extent of the dangerous space depends on:—

(a) The range.

This diagram shows height increased six times.



Range = 600 yards. Slope of fall = 1 in 90.
∴ Dangerous space for prone man (1 ft. high) is approximately 30 yards.



Dangerous space is approximately 10x.

FIG. 3.

(b) The height of the weapon above the ground level.

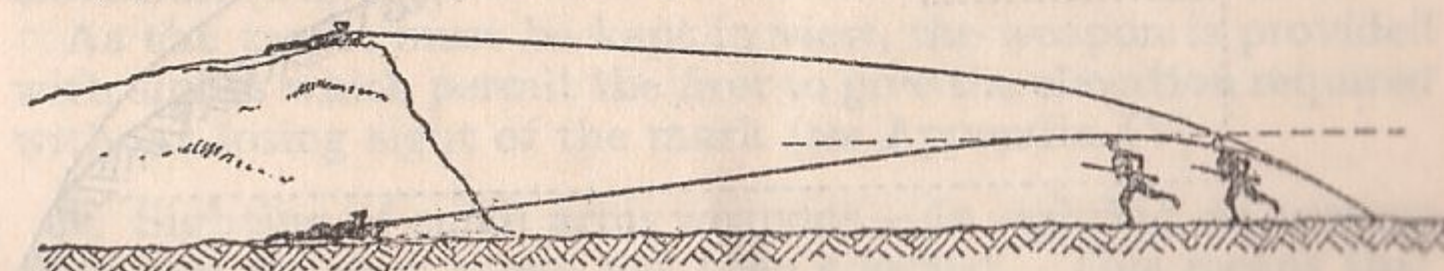


FIG. 4.

(c) The height of the object fired at

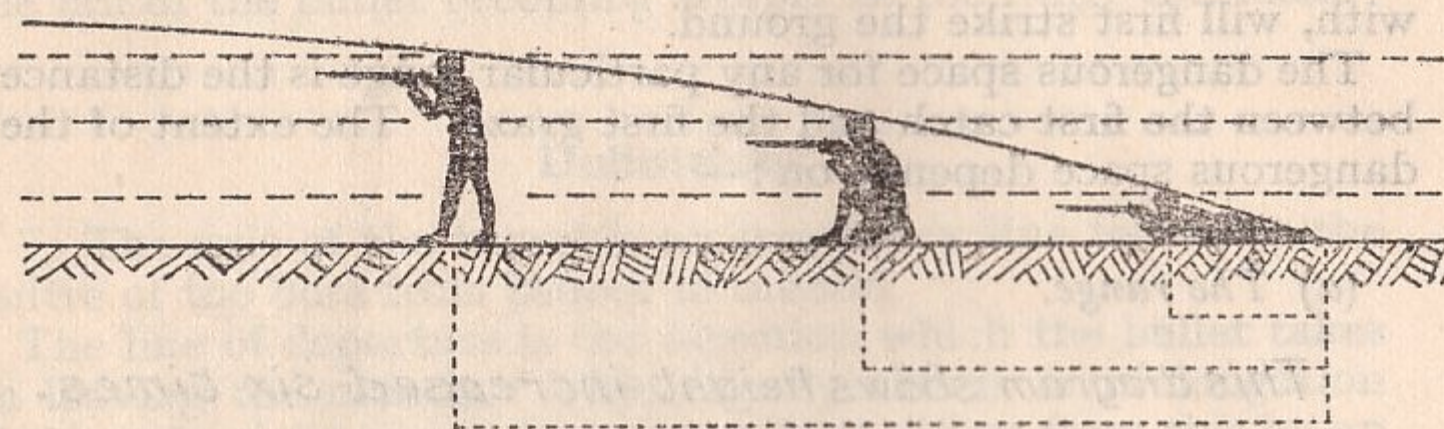


FIG. 5.

(d) The flatness of the trajectory

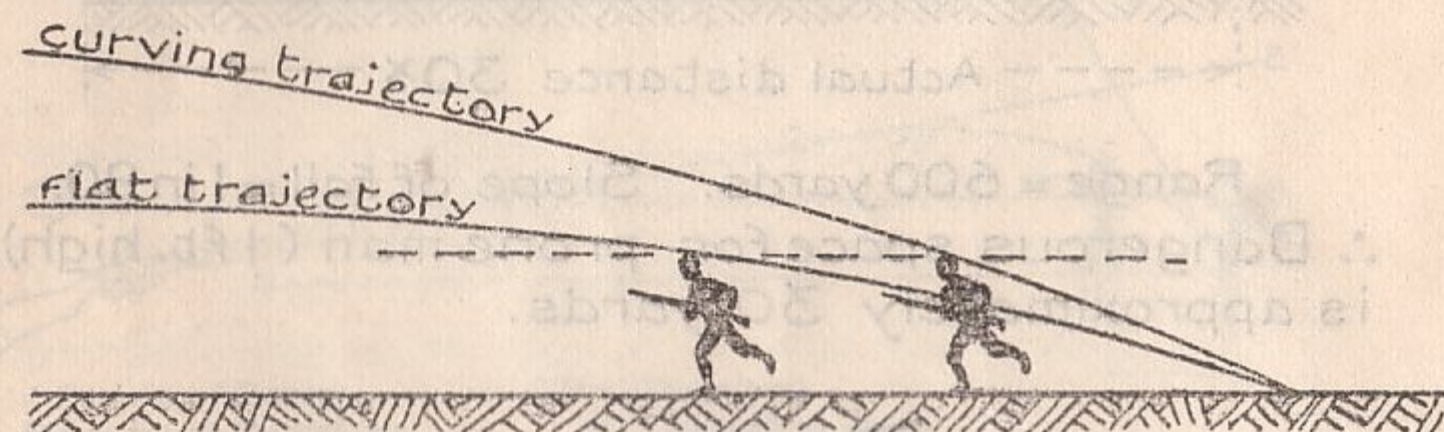


FIG. 6.

(e) The conformation of the ground

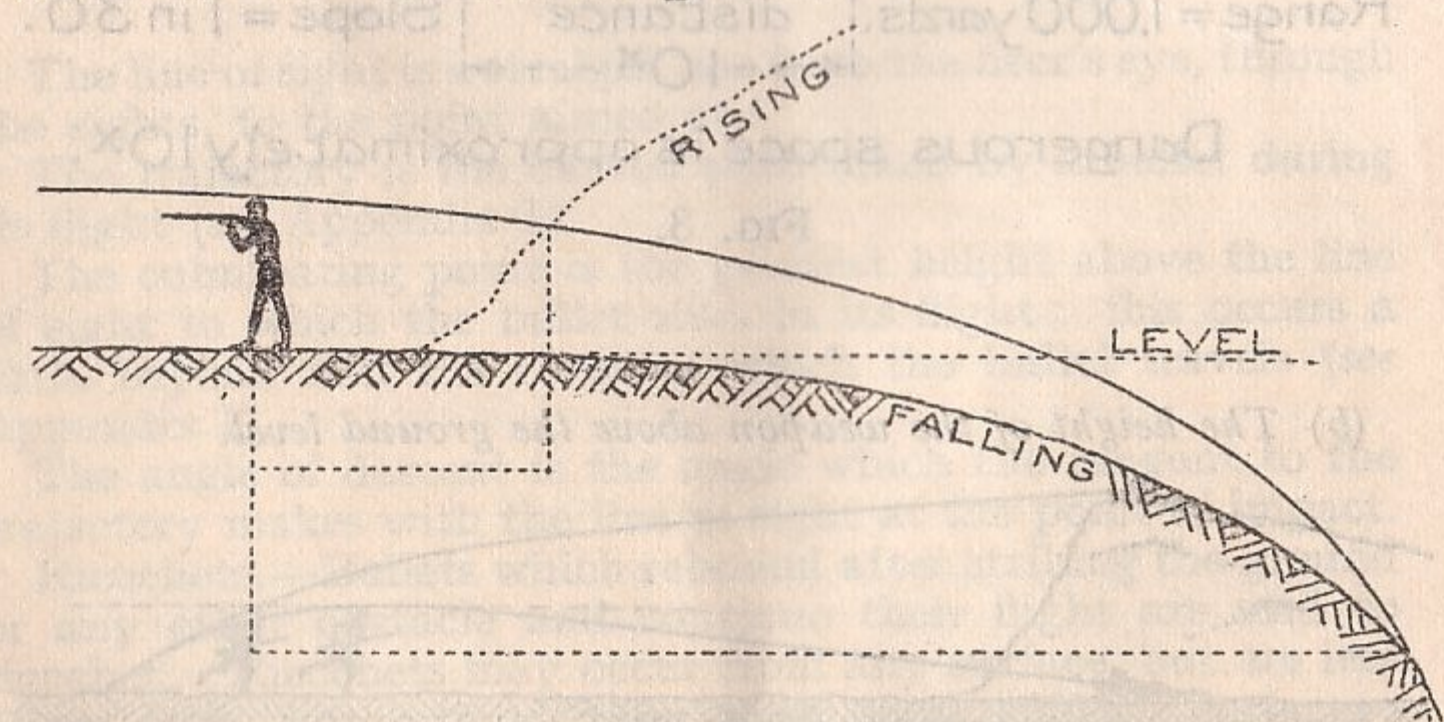


FIG. 7.

The dangerous space :—

decreases :

As the range increases, owing to the steeper angle of descent of the bullet at the longer ranges (see Fig. 3 and Range Table, Appendix II).

increases :

- (a) The nearer the weapon is to the ground (Fig. 4).
- (b) The higher the object fired at (Fig. 5).
- (c) The flatter the trajectory (Fig. 6).
- (d) The nearer the slope of the ground conforms to the angle of descent of the bullet (Fig. 7).

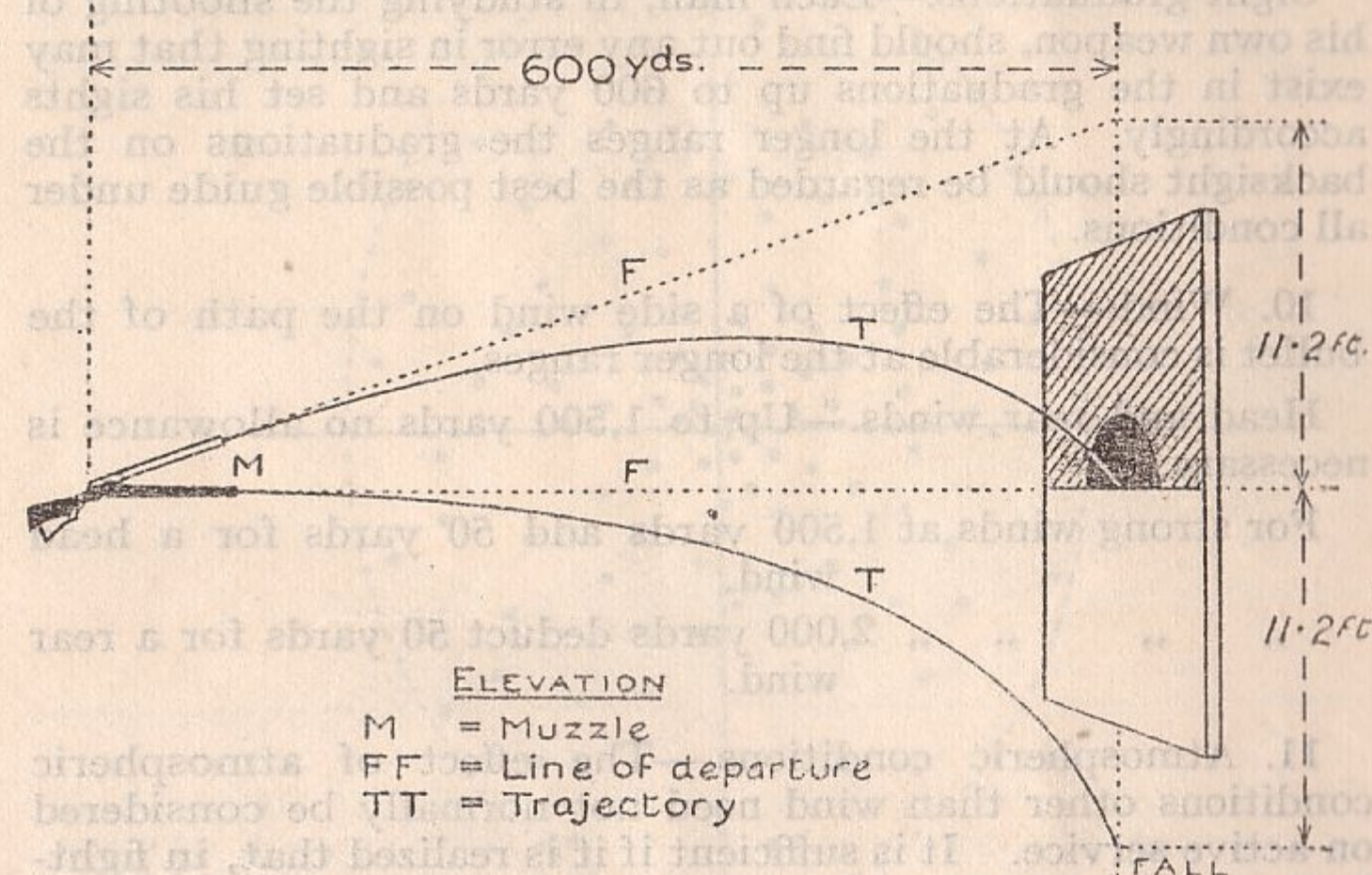


FIG. 8.

8. Elevation.—In order to allow for the fall of the bullet, it is necessary to direct the line of departure as much above the object to be hit as the bullet will fall below it if the axis of the barrel is pointed at the target. This raising of the barrel to allow for the curve of the trajectory is termed giving elevation (Fig. 8).

As the target must be kept in view, the weapon is provided with sights which permit the firer to give the elevation required without losing sight of the mark (see Appendix IV).

9. Sighting of small arms weapons.—In sighting, an average elevation for each range has been adopted. This means that the sight graduations of each weapon give the average elevation

required by many thousands of weapons. In addition, each weapon is carefully tested at short range before issue and is sighted to hit the point aimed at, within certain close limits. There are, however, in each weapon small manufacturing variations which cannot be avoided in large-scale production. Further variations are produced by wear of parts, by the slackening or tightening of screws and in the packing of Vickers machine-gun barrels. These inequalities produce an individuality in each weapon which shows itself in a slight variation of the sighting elevation required; it is therefore necessary for each man to study the shooting peculiarities of the weapon with which he is armed.

Sight graduations.—Each man, in studying the shooting of his own weapon, should find out any error in sighting that may exist in the graduations up to 600 yards and set his sights accordingly. At the longer ranges the graduations on the backsight should be regarded as the best possible guide under all conditions.

10. Wind.—The effect of a side wind on the path of the bullet is considerable at the longer ranges.

Head and rear winds.—Up to 1,500 yards no allowance is necessary.

For strong winds at 1,500 yards add 50 yards for a head wind.

“ “ “ “ 2,000 yards deduct 50 yards for a rear wind.

11. Atmospheric conditions.—The effect of atmospheric conditions other than wind need not normally be considered on active service. It is sufficient if it is realized that, in fighting at high altitudes, less elevation may be necessary. The variation will only be about 50 yards at 800 yards' range at a height of 4,000 feet.

Alterations of temperature need not be taken into consideration, except that, when cartridges have become heated in the sun, some rifles are liable to shoot high.

12. Light.—In bad light the foresight is less distinctly seen than in a good light and more of it is unconsciously taken into the line of sight. This factor naturally affects the elevation used, less being required on a dull than on a bright day.

Part 2.—Elementary Theory (M.G.)

13. This part deals with theory in respect of a series of shots fired from a machine gun.

14. When fire is delivered at a target, the bullets pass through the air in a “cone of fire,” which is the pattern formed by a series of shots fired with the same elevation and point of aim. This pattern is oval in shape, its density decreasing from the centre outwards (see Fig. 9).

CONE OF FIRE.

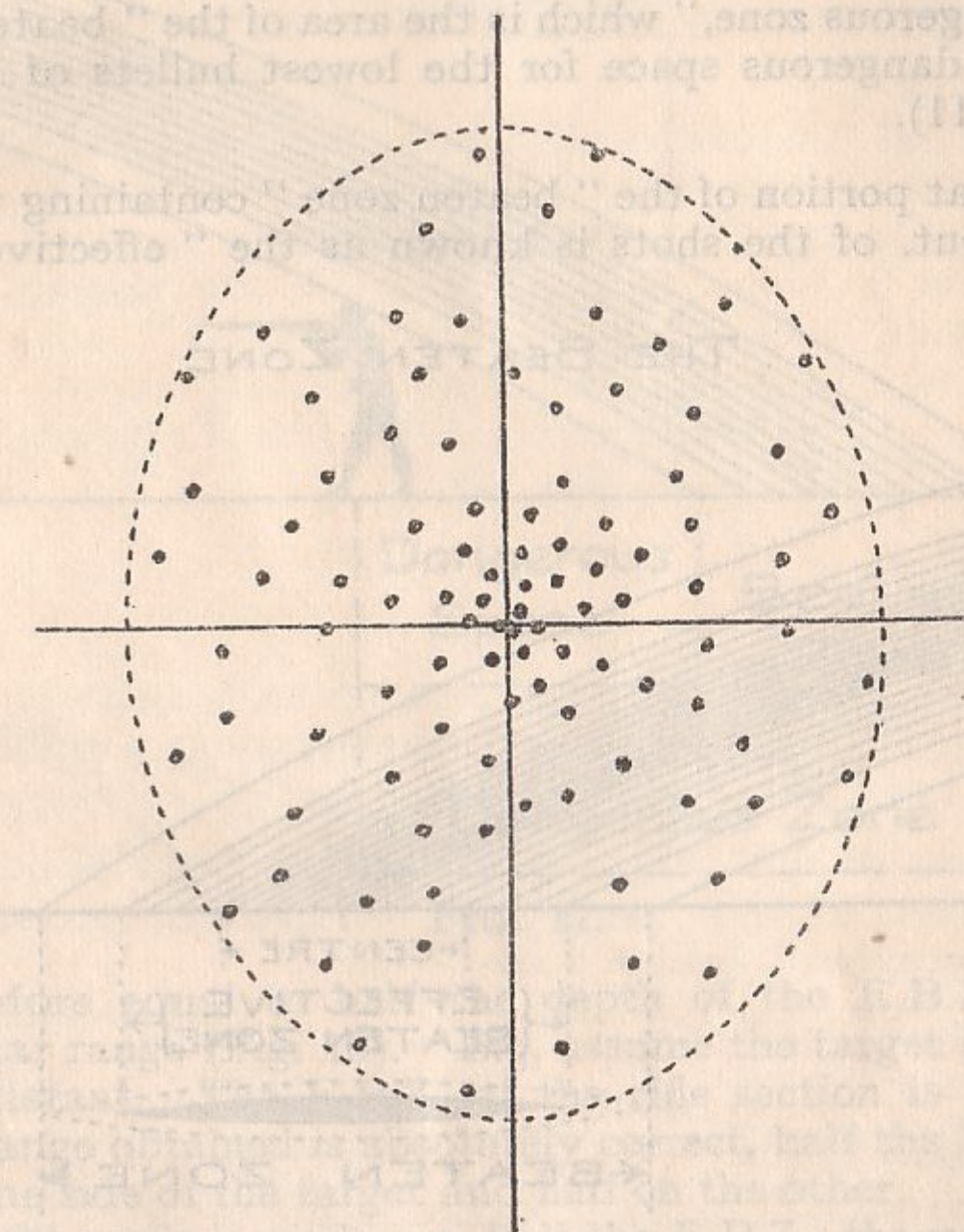


Diagram of a cone of fire showing the pattern made by a group of 100 shots fired at a target.

FIG. 9.

The cone of fire from a machine gun is generally smaller than that formed by the fire of a number of riflemen, since the skill and eyesight of men and the shooting of rifles vary.

When fire is correctly directed on to a target, the pattern of the cone will form a "beaten zone" on the ground round the target.

15. The size of the "beaten zone" will vary with the range and slope of the ground in relation to the angle of descent.

Dangerous zone

16. For fire to be effective, the target must be included in the "dangerous zone," which is the area of the "beaten zone" plus the dangerous space for the lowest bullets of the cone (see Fig. 11).

17. That portion of the "beaten zone" containing the inner 75 per cent. of the shots is known as the "effective beaten zone"

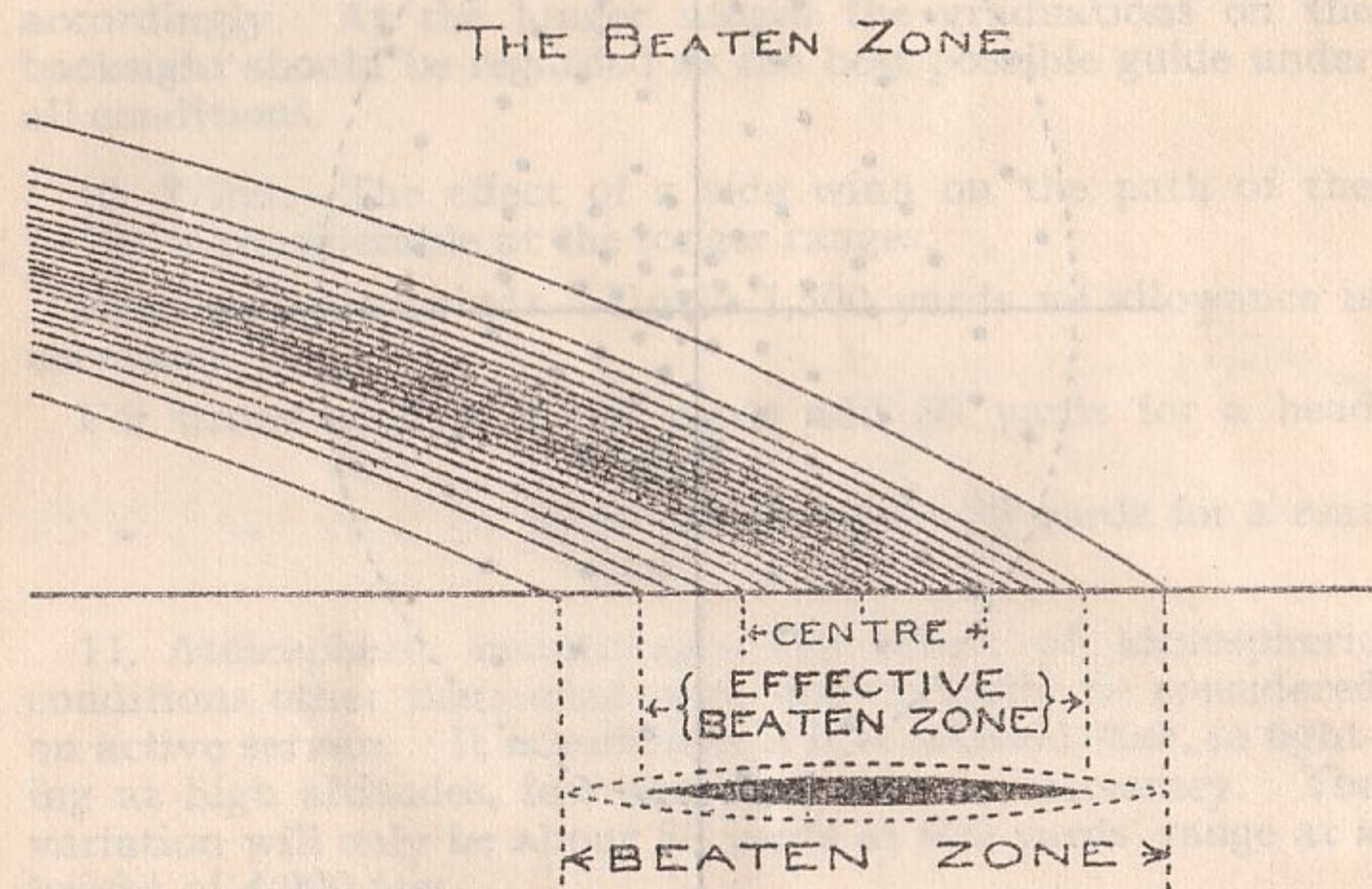


FIG. 10.

zone" (E.B.Z.). The best results can only be expected if the target is included within the E.B.Z. for any range.

As the range increases, the length of the E.B.Z. decreases (Fig. 12). This is due to the increased angle of descent of the bullet. Beyond 1,500 yards the E.B.Z. increases again, especially laterally, and at the same time the angle of descent becomes steeper and the dangerous space becomes less. As a result, more bullets have to be fired to obtain fire effect at longer ranges and the range has to be more accurately known.

Ranging

18. *Ranging* is the process of determining by observation of fire the direction and elevation required to hit a given target. The "permissible error" in ranging is the term applied to the error which can be made in estimating range while still keeping the target within the E.B.Z. The permissible error in ranging

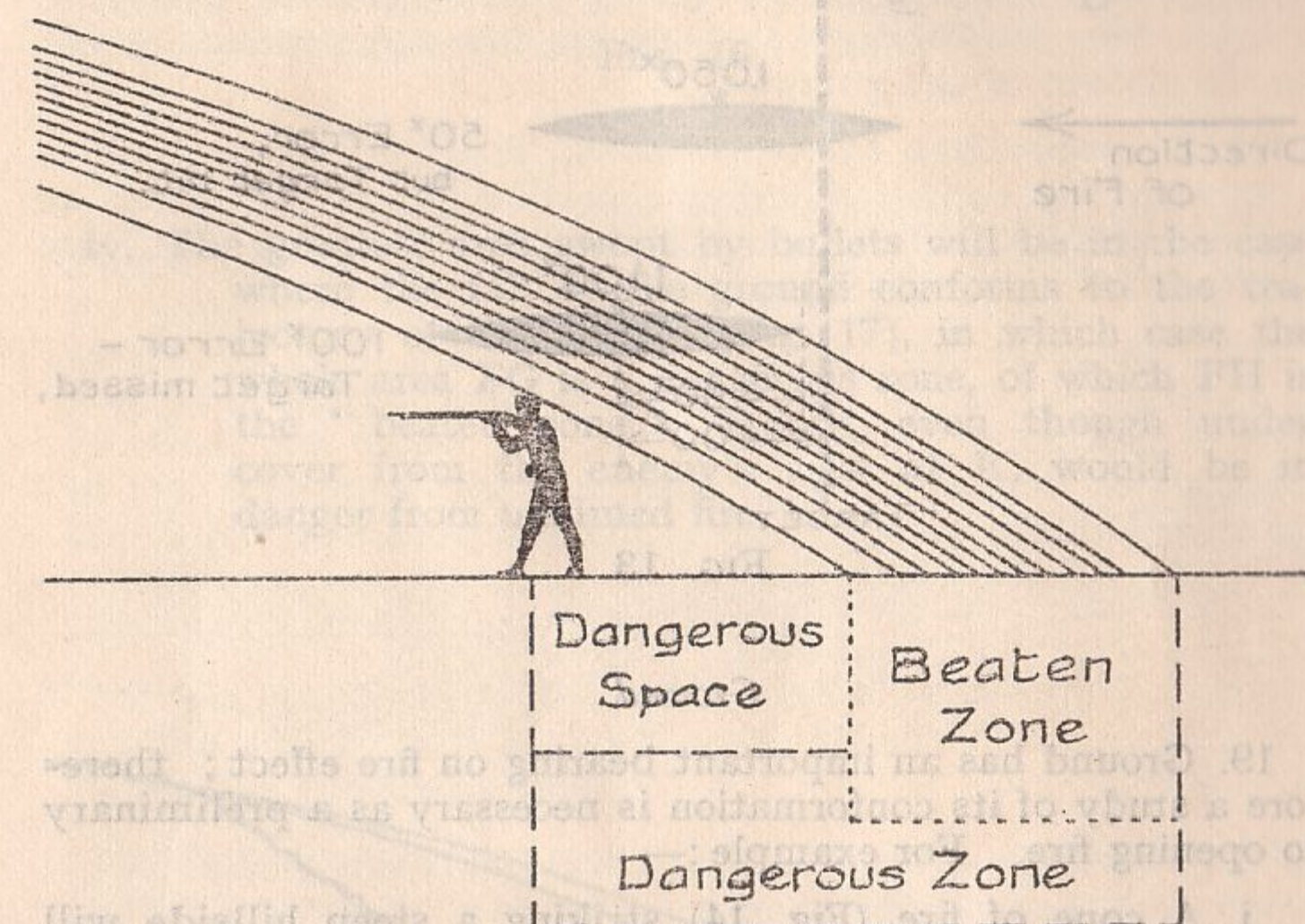


FIG. 11.



is therefore equal to half the depth of the E.B.Z. for any particular range (Fig. 13). E.g. assume the target to be 1,000 yards distant. The E.B.Z. of the rifle section is 180 yards. If the range obtained is absolutely correct, half the E.B.Z. will be on one side of the target and half on the other. If an error of over 90 yards is made, i.e. half the E.B.Z., the whole of the E.B.Z. will miss the target.

EFFECTIVE BEATEN ZONES (75%).

On level ground.

(Not to scale).

WEAPON : RANGE : E.B.Z.

RIFLE SECTION { 500yds. 330yds. x 7ft. 
1,000yds. 180yds. x 14ft. 

BREN { See Pamphlet No. 4, 1939 (page 5).

FIG. 12.

PERMISSIBLE ERROR = $\frac{1}{2}$ E.B.Z.

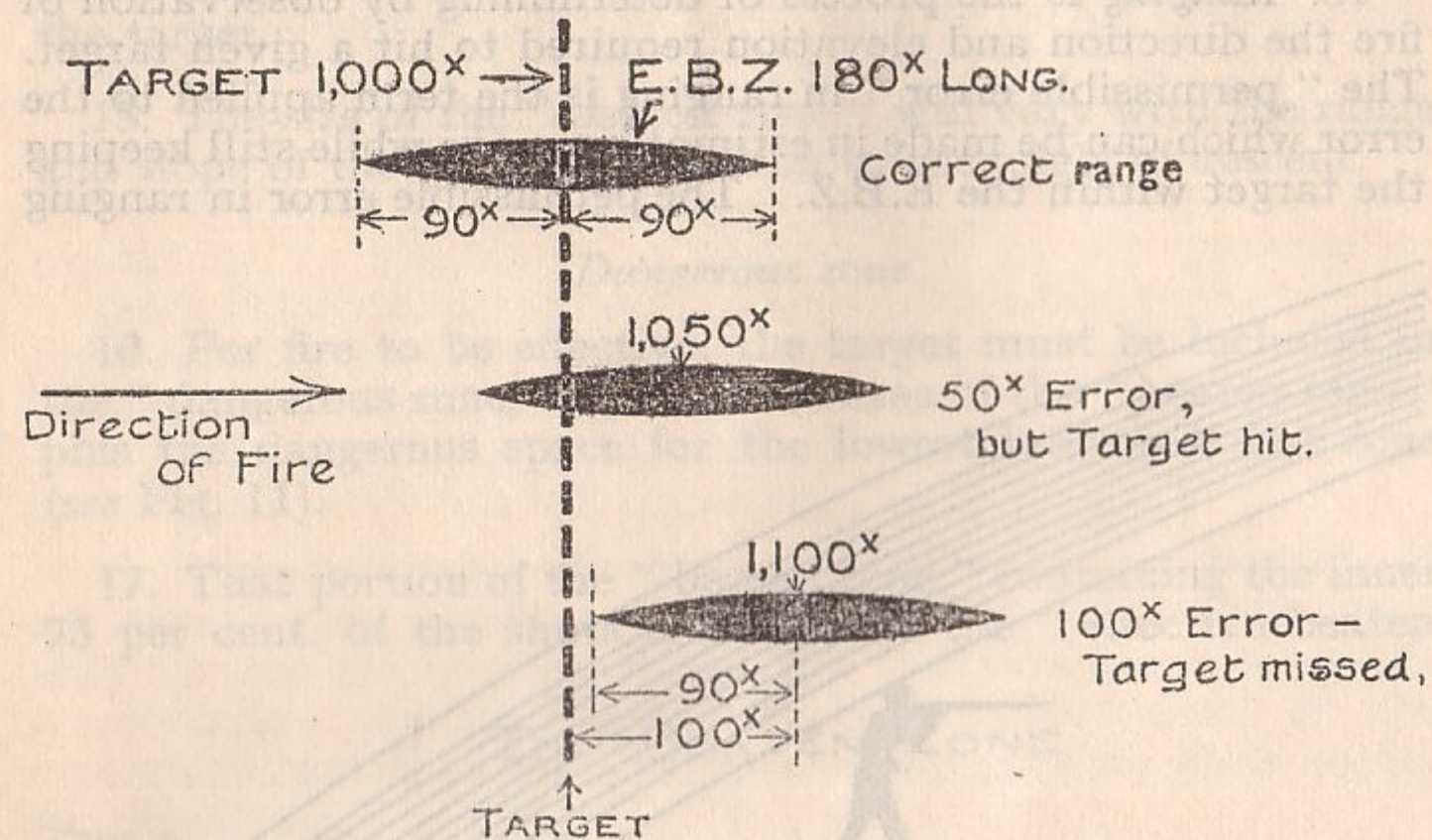


FIG. 13.

Ground

19. Ground has an important bearing on fire effect; therefore a study of its conformation is necessary as a preliminary to opening fire. For example:—

- i. A cone of fire (Fig. 14) striking a steep hillside will cover a very small area of ground, producing a restricted "beaten zone"—AB.

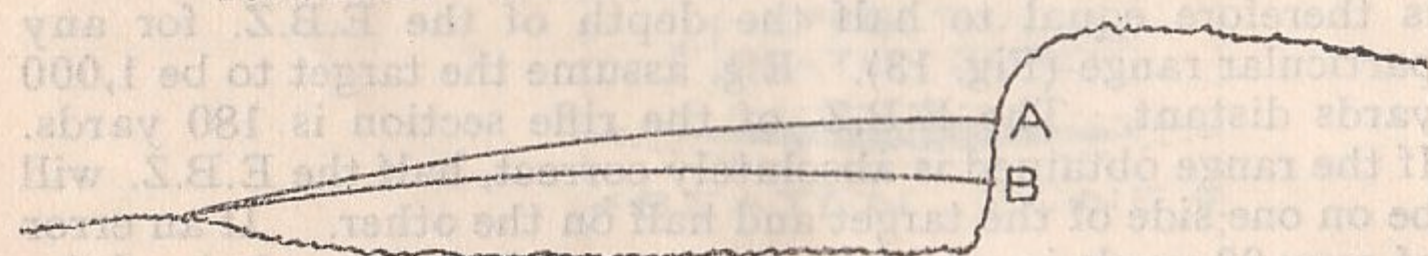


FIG. 14.

- ii. The same cone of fire (Fig. 15) striking a gentler slope will cover a slightly larger area of ground—BC.

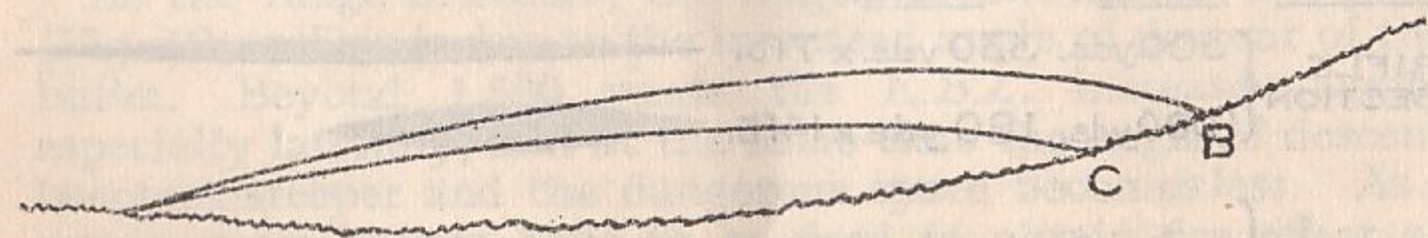


FIG. 15.

- iii. In similar proportion—see DE, Fig. 16.

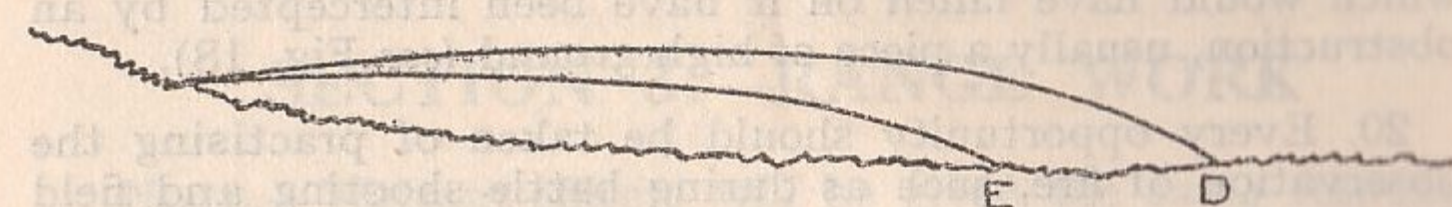


FIG. 16.

- iv. The greatest area swept by bullets will be in the case where the fall of the ground conforms to the trajectory of the bullets (Fig. 17), in which case the whole area FG is a dangerous zone, of which FH is the "beaten zone." Troops, even though under cover from the enemy's view at K, would be in danger from unaimed fire.

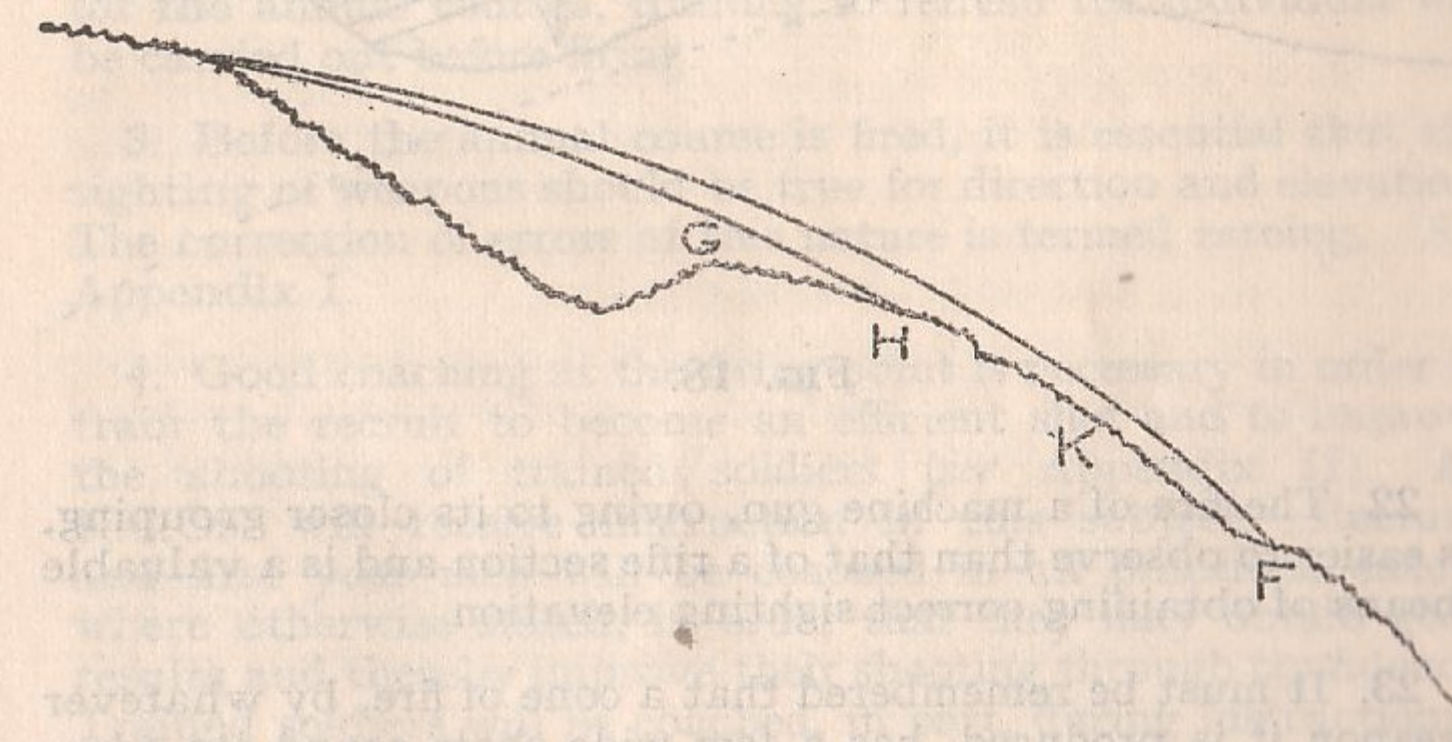


FIG. 17.

The above considerations indicate that it is more difficult to get fire effect against rising ground than against ground which is flat or falling away.

A defiladed zone is the area of ground which would be included in the "beaten zone" but for the fact that the bullets which would have fallen on it have been intercepted by an obstruction, usually a piece of high ground (see Fig. 18).

20. Every opportunity should be taken of practising the observation of fire, such as during battle shooting and field firing. The possibilities of observing fire will depend largely on the nature of the ground.

21. If observation can be obtained, it is the best method of obtaining the correct sighting elevation, since the errors in judging distance due to variations in light, ground, etc., are automatically overcome (see Pamphlet No. 2).

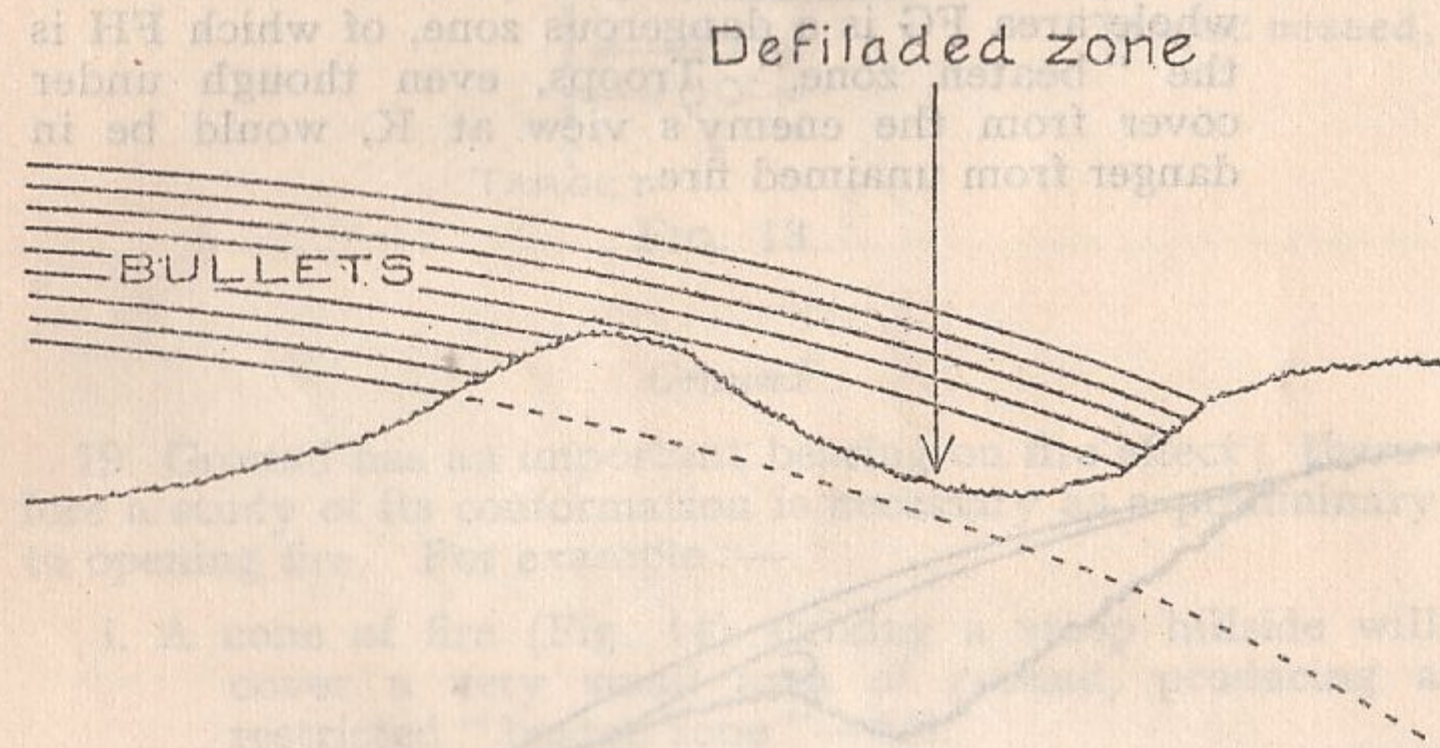


FIG. 18.

22. The fire of a machine gun, owing to its closer grouping, is easier to observe than that of a rifle section and is a valuable means of obtaining correct sighting elevation.

23. It must be remembered that a cone of fire, by whatever weapon it is produced, has a few wide shots round its edge. The observation of the strike of single bullets must, therefore, not be taken as indicating the central portion of the E.B.Z.; rather the reverse, since, if the ground will show one shot, it will show more if they are there.

24. If the fall of bullets both short of and beyond the target is observed, it is safe to assume that ranging is correct. Bold alterations in elevation should be made when correction is observed to be necessary on a steep slope.

SECTION 3.—RANGE WORK

NOTE.—Warrant officers will be given the same responsibilities as are given to officers in Section 3.

General

1. Range courses, to be fired annually, are detailed in Pamphlets 14, 15, 16 and 17 and may be altered periodically in accordance with changes in tactical doctrine. They lead gradually from shooting at elementary targets under artificial conditions to battle shooting, designed within the limits of the classification range to exercise individuals practically in some of the lessons on the application of fire taught in Pamphlet No. 2 (i.e. fire discipline and judging distance) and in fire and manoeuvre, snapshooting and firing at moving targets. The course is a preliminary to field firing.

2. To obtain the fullest value from the ammunition allotted for the annual courses, training to refresh the individual will be carried out before firing.

3. Before the annual course is fired, it is essential that the sighting of weapons should be true for direction and elevation. The correction of errors of this nature is termed zeroing. See Appendix I.

4. Good coaching at the firing point is necessary in order to train the recruit to become an efficient shot and to improve the shooting of trained soldiers (see Appendix II). All N.C.Os. will receive instruction in this subject. Recruits and first year men will be coached in all practices, except where otherwise stated, in order that they may obtain good results and thereby improve their shooting through confidence. Trained soldiers will be coached, in part, during instructional, but not during classification, practices. Soldiers in the Territorial Army will be coached throughout their service.

5. With mortars and machine guns it will seldom be possible to practise "fire for effect" owing to the large expenditure of ammunition involved; therefore, in the Vickers gun and mortar units the training of fire unit leaders and potential leaders is of particular importance. A high average standard must be the aim, rather than the training of a few experts.

6. Opportunities should be given to all gun numbers, and also to other units which are not armed with the particular weapons, to watch the firing of the annual course. Similarly, demonstrations of all methods of indirect fire should be given to all machine-gun sub-units.

7. Demonstrations with service and tracer ammunition may be usefully employed in all stages of weapon training. These are of two types:—

i. Technical. To show the limitations and powers of weapons and their effect on the application of fire. The following are some examples:—

- (a) Elementary theory, showing trajectory, effect of wind, elevation, cones of fire, length of "beaten zone."
- (b) Penetration of the bullet into various substances which may be used as cover in the field.
- (c) System of application of fire. (This can also be carried out on miniature and 30-yard ranges.)
- (d) Comparative tests of fire effect—the individual, the light machine gun, the platoon and the Vickers machine gun.
- (e) Vulnerability of various formations, as affected by direct, enfilade or oblique fire.
- (f) Effect of ground on the beaten zone—in the case of the light machine gun or machine gun.
- (g) To show the margin of safety in overhead and flanking machine-gun fire.

Of the above, (a) is suitable during recruit training and should be fired on the classification range; (b) and (c) should be given in the early stages of the training of fire unit leaders and should precede field firing.

ii. Tactical. To show the practical application of fire to a given tactical situation, illustrating methods of fire direction and control.

RANGES

The characteristics of, organization of duties on, and use of various types of ranges are given below.

Miniature Ranges

8. Miniature ranges are most suitable for the early rifle training of the recruit where elementary lessons in aiming,

holding, trigger pressing, and many of the main factors which make for accurate shooting can be practised.

The difficulties of service shooting are not reproduced. There is no shock of discharge and there are no estimations of range, wind, etc. The windgauge, however, may be used to teach "aiming off."

9. The rifles used will be of service pattern .22-inch R.F. Each rifle should be periodically tested by a good shot and a board kept in the range, showing the exact elevation required. Before firing, the instructor will check this.

10. Rifles with varying sizes of butt will be kept available and care will be taken that every man fires with a rifle which fits him (see Pamphlet No. 3, Rifle).

11. Only .22-inch ammunition will be used.

12. Various types of representative targets are provided and these are shown in S.A.T., 1931, Vol. V, Appendix V.

13. Practice should begin as soon as the recruit can adopt the lying position, aim and press the trigger correctly. It should also form part of the preliminary training which precedes range courses.

14. Practices should conform to those fired later with service ammunition. Battle shooting can be carried out on miniature battle shooting ranges.

15. Scoring will be similar to that laid down for classification ranges (see para. 48, below). Groups will be measured with wire rings 1, 2 and 3 inches in diameter. Recruits must reach a 3-inch standard.

16. Targets should be examined after each detail. Spotting may be carried out from the firing point by means of field glasses. Range discipline will conform, as far as possible, to that on the classification range.

30-Yard Ranges

17. 30-yard ranges are generally near barracks and may be used all the year round. They have certain advantages over miniature ranges. The man uses his own rifle or section weapon and becomes accustomed to the shock of discharge and the noise of the firing.

18. Discipline will conform as far as possible to that in use on the open range.

19. Where convenient, bayonet assault courses will be provided behind the firing points.

20. In rifle practices, groups will be measured as in para. 15, above. For L.M.G. practices rings measuring 2, 3 and 4 inches in diameter will be used. For M.G. practices rectangles measuring 2 inches by 4 inches and 4 inches by 6 inches will be used.

Classification Ranges

21. Shooting at service distances is carried out on the classification range. It will be used for the firing of range courses, including battle shooting for the training of the individual as a preliminary to field firing, which exercises the fire unit.

22. *Range orders.*—G.Os.C.-in-C. will issue orders to ensure safety. Copies of the orders will be posted in the butts and will be issued to all units in the station concerned. Attention will be given in particular to safety precautions for anti-aircraft practices and for 30-yard ranges.

23. *Annual range courses.*—The detail of the annual range courses is laid down in Pamphlets Nos. 14, 15, 16 and 17, and will be fired by all ranks other than those exempted in the pamphlets.

As far as possible, all men on the strength of companies should be made available to fire with their company. Those unable to do so will be formed into a party of "casuals" to fire the course.

Soldiers serving away from their own unit will fire with the unit to which they are attached.

Practices for recruits and first-year men should be fired in the order in which they appear in the tables. Rapid practices should be fired immediately after the deliberate practice at the same range. Ranging, application and distribution practices should be fired consecutively without leaving the firing point.

If a practice is not completed by any individual, the points scored will not count and the whole practice will be fired again.

24. *Dress.*—In classification practices, service dress fighting order will be worn by the Regular Army and drill order by the Territorial Army. Recruits at depots and in units will wear drill order. Field glasses will be carried by all officers and by warrant officers and N.C.Os. equipped with them. As many firing point instructors as possible should be provided with these glasses to assist them in coaching.

25. *Supervision.*—In the Regular Army, during instructional practice, an officer will normally supervise at all times at the firing point, but in exceptional circumstances where no officer is available C.Os. may give authority for supervision by warrant officers. Duties in the butts may be carried out by N.C.Os.

During classification practices, officers, N.C.Os. and men from sub-units other than that which is firing will always be detailed for all duties of supervising and marking. Assistance generally and for the identification of firers will be provided by the officers of the sub-unit which is firing.

In the Territorial Army, on the written certificate of brigade commanders, where an officer cannot be present, the supervision of instructional practices may be carried out by the warrant officers and N.C.Os. of the permanent staff. In classification practices, where it is impracticable on the certificate of brigade commanders to carry out the rules laid down for the Regular Army, supervision and marking may be done by the sub-unit which is firing and by the permanent staff instructors, provided that there is at least one officer in control of the range.

26. *Range discipline.*—To avoid delay, a simple system of issuing ammunition and ensuring that details next to fire are ready will be devised by units in accordance with the following general instructions:—

- i. There should be an instructor for each firer (if entitled).
- ii. A N.C.O. or man should be detailed as telephone orderly.
- iii. A N.C.O. should be responsible for the issue of ammunition and collection of empty cases and live rounds.
- iv. In grouping practices, two details should fire and then proceed to the targets to see their groups measured and note the position of their M.P.I. If it is not practicable to send the firers up to the targets, the results may be signalled (see page 47).
- v. In snapshooting practices, the timed exposures of the target will be controlled by the officer on butt duty. The exposure will be reckoned from the time when the target is in position and stationary to the moment when it is again moved for lowering.

In rapid practices, the time will normally be regulated from the butts. In these cases the actual fire order by the officer superintending at the firing point will be in anticipation of the targets appearing. This officer will inform the officer in the butts when

the detail is ready. Where the normal procedure cannot be adopted, the targets will be exposed before the practice begins and the timing carried out at the firing point.

- vi. *Occasional shots*.—Occasional shots to verify elevation or strength of wind, or the accuracy of the weapon, may sometimes be fired by an officer or N.C.O., with the senior officer's permission. They will not be fired during practices of the classification or qualification tests. Notification of their beginning and end will be made to the officer in the butts. The target in use will be lowered and checked and a clean one raised for the occasional shots. When they are completed, it will be lowered and checked and the original target raised for the firer to complete his rounds.

Allowances and Penalties

- 27. i. The use of the windgauge and sling is prohibited.
- ii. No sighting shots are allowed, unless provided for in the practice.
- iii. The fine adjustment may be used in any practice.
- iv. Allowance for jams and missfires:—
 - (a) If a jam or stoppage, due to breakage or a defect in mechanism, occurs, and is not caused by any fault of the firer, the time allowed for the practice will be increased to the extent due to the delay thereby resulting. Should a jam or stoppage occur in a rapid practice through a defect which cannot be quickly rectified, the whole practice will be repeated.
 - (b) In the event of missfires, provided that the superintending officer is satisfied that the cap of each cartridge has been struck, extra rounds will be allowed equal to the number of missfires which occur in the practice concerned, a proportionate part of the time allowed for the whole practice being given for each extra round. In the case of pistol the round will be tried in another pistol.
 - (c) In fire with movement practices no allowance will be made for jams or missfires.
- v. *Forfeiture of rounds*.—Omission to fire the rounds allotted or failure to fire during an exposure will entail forfeiture of the rounds which should have been fired, and misses will be recorded for them.

- vi. For every shot fired after the order or signal to cease fire has been given, the value of the highest hit obtainable by a single shot will be deducted.
- vii. In machine-gun practices, belts and magazines will be filled by the firers who are to use them. Opportunity will be given to the firer, before he begins any practice, to inspect the gun and ammunition which he is to fire.
- viii. Short busts in firing the L.M.G. and M.G. will be penalized. (See Pamphlets Nos. 14 and 15.)

28. The following is the interpretation of terms used in the detail of range practices:—

- (a) With rifle rested. Hand and forearm supported against the cover. The rest (usually sand-bags) may be adjusted to suit the firer.
- (b) In the open. No support of any kind is allowed for the weapon, forearm or wrist.
- (c) Over or round cover. The cover must be used as taught and no adjustment to suit the firer is permitted.

Field Firing Ranges

29. Exercises with ball ammunition on the field firing range are the culmination of weapon training. The field firing range provides conditions most nearly akin to war, and all shooting on other ranges will be regarded merely as a means to obtain efficiency in this final test. The capabilities of companies may here be judged far better than by the results obtained on classification practices, or in competitions, where conditions are mainly artificial.

Officers responsible will visit the range and prepare the practices, having regard to the lessons to be taught, target facilities, safety precautions and ammunition available. The value of the exercise will depend on sound preparation, clear explanation to those taking part and a well-conducted criticism at the conclusion. Simple problems should be designed so that all actions of the fire unit are such as would be possible and likely in war.

30. The siting and exposure of targets and methods of checking them will be arranged. Markers will always be rehearsed in their duties. (For targets and appliances, see Vol. V.)

31. Officers or N.C.Os. will be detailed to each fire unit to watch its action and must conform to the movements of the section. They will be responsible to the officer superintending for safety precautions, but, apart from ensuring that these are observed, they will not interfere with the actions of firers or leaders.

32. Targets will be provided for each firer or fire unit and will be checked after a practice, and the percentage of hits to rounds fired, or in distributed fire the percentage loss inflicted on the enemy, will be recorded. Falling plates and collapsible targets add interest. Figure targets should be arranged to resemble formations likely to be used by the enemy.

33. Fire units will not be exercised in engaging targets at distances exceeding 1,000 yards, except in the case of carrier platoons.

34. Where a field firing range is not available, suitable ground may be hired and the cost charged against the training grant. Failing this, it is sometimes possible, with ingenuity, to carry out useful practices on the flanks of the classification range, provided that the danger area permits.

35. A convenient method of discussion at the conclusion of the practice is as follows :—

The individual or fire unit commander states the information and orders which he received, his action, and the reasons for it.

The officer or N.C.O. watching the practice states his views.

The superintending officer, in summing up, after stating the factors affecting the situation and the alternatives, gives his opinion as to the correct action to be taken, bringing out the chief lesson of the exercise.

36. Greater value for the ammunition expended will sometimes be obtained by a rehearsal without ammunition.

37. Owing to restrictions imposed by safety precautions, it will seldom be possible at home stations to carry out exercises for sub-units larger than a platoon. Unless freedom of action is possible after the opening situation, greater value may be obtained by demonstrations of platoon, and possibly company, actions.

38. Vickers machine gun units will generally concentrate at stations where ample facilities for field firing exist. The nature of the practices to be carried out will be settled annually by the divisional commanders concerned.

As a general guide, fire control and discipline and observation should be practised by the personnel of all platoons as under before tactical exercises are carried out.

Nature of exercise

Personnel to practise and receive instruction

- | | |
|--|---------------------------------------|
| i. Fire control—Direct. | } All N.C.Os. and potential N.C.Os. |
| ii. Fire control — Indirect.
Day and night. | |
| iii. Fire discipline—Direct. | } Officers and N.C.Os. |
| iv. Fire discipline—Indirect.
Day and night. | |
| v. Observation of strike (including use of field glasses). | } Junior N.C.Os. and privates. |
| vi. Duties of range-takers during firing. | |
| vii. Maintenance of sustained fire (stoppages should be included in all belts, except for demonstrations). | } Officers, N.C.Os. and range-takers. |
| | |
| | } Range-takers. |
| | |
| | } Troopers and privates. |
| | |

39. *Records.*—Company commanders will keep records of all practices fired, with details of results.

40. *Combined exercises.*—In stations where facilities exist, combined exercises with ball ammunition may be carried out to practise the co-operation of all, or certain, arms in battle.

Safety Precautions (All Ranges)

41.—i. Firing will not take place until the danger flags are hoisted and look-out men posted according to the by-laws and standing orders.

ii. A red danger flag will be hoisted at the butts as a warning to cease fire. The flag will be kept up until the whole of the butt party is under cover. No one will leave the butts until the cessation of fire has been notified from the firing point. When cessation of fire is required, the superintending officer at the firing point will normally give the order.

iii. A red flag will be hoisted at the firing point when no firing is taking place. It will always be hoisted when the danger flag is flying at the butts.

iv. Weapons will be pointed towards the butts during inspection and when loading or unloading takes place.

v. No one, except the firers, the instructors and the officers on duty, will be allowed on the firing point.

vi. If firing is suspended during a practice, or whenever the danger flag is hoisted at the butts, safety catches will be applied, rifles will be laid on their side, locks of Vickers machine guns will be removed from the lock guides, magazines will be removed from light machine guns, weapons on the firing point will not be touched and firers will stand up.

Light machine guns will be unloaded without firing the round in the chamber. A.Tk. Rifles will be unloaded.

vii. No one will be in front of the magazine or feed block in machine-gun practices.

viii. After firing, live rounds will be separated from empty cases and collected, under the orders of the superintending officer.

ix. An officer will inspect all weapons, magazines and equipment before they are removed from the firing point, to ensure that they are unloaded and that the men are not in possession of ammunition. A further inspection will take place before the company or party leaves the range, and A.F. B 159A will be completed.

x. Repairs and replacements will not be carried out until a gun is clear. No one except the gun numbers authorized to be on the firing point by the conditions of the practice will be permitted to touch the gun without permission when a stoppage occurs.

xi. No weapon will be loaded without orders from the superintending officer.

xii. Dummy cartridges will not be taken on the range, except for use in stoppage practices. In this case the dummy cartridges will be taken to and from the range under the orders of the company, etc., commander.

xiii. Pistols will be kept in the case until actually required for use. When out of the case, they will be carried at the rest position.

xiv. Indiscriminate snapping is forbidden.

xv. After firing with the pistol, the officer in charge will give the order "Unload". No one will be allowed to move towards the target until the officer in charge gives an order to that effect.

xvi. In anti-aircraft practices, unless the danger zone extends to a depth of 3,500 yards behind the stop-butt, the siting of targets and weapons must be so fixed that all bullets are caught in the stop-butt. In traversing practices, targets must be sited so that the line of fire is within the width of the danger area (*see S.A.T., 1931, Vol. V, Sec. 15*).

xvii. In battle shooting, a firer may **not** fire from a point outside his lane nor at a target outside it. No targets, other than those in the butts, will be engaged at a distance of less than 200 yards.

xviii. When firing at night takes place, special precautions for safety must be taken. Firing will take place only from that part of the range which gives the greatest safety margin against oblique fire. A target directly to the front of the firer only will be engaged. In firing on fixed lines these will be laid out in daylight. Fire, if possible, will be from a trench or weapon pit and no target over 200 yards distance should be engaged, except in firing on fixed lines.

Stops should be erected on the firing point for each weapon so as to obviate the possibilities of oblique fire. Two pegs aligned longitudinally on to the target, against which the weapon can be rested, is a simple way to ensure this. A wire or strut fixed across the firing point at such a height as to prevent muzzles of weapons being raised and so permitting bullets to pass over the stop butt should be used.

Red lamps will be used at the firing point and in the butts or target pits in substitution for red flags. Before a lamp is taken in or first exposed, it will be swung to and fro to attract attention; this will ensure that the lamp has not been accidentally extinguished.

42. *Additional precautions for miniature and 30-yard ranges.*—

Miniature range.—When it is necessary to examine targets, rifles will be unloaded and laid on the firing point with the breech open, and the red flag will be raised before anyone goes to the target.

30-Yard range:—

i. No more than six rifles or four machine guns will be fired at the same time on the standard 30-yard range.

- ii. During the firing of machine-gun practices, the superintending officer may make special arrangements to call those waiting to fire up to a position from which they can hear the instruction and criticism, but even then they must be at least five yards in rear of the firer.
- iii. No target will be placed within four feet of the sides of the bullet catcher.
- iv. Representative targets and pistol targets will be placed at the bottom of the bullet catcher.
- v. Landscape targets will be placed so that the skyscreen is at the bottom of the bullet catcher and the picture below it.
- vi. Anti-aircraft targets, .22-inch, will be placed so that the line of fire is directed into the bullet catcher.
- vii. Steel plates, moving targets and anti-aircraft targets, other than the approved .22-inch, are not allowed.
- viii. Pistol practices involving the advance of the firer or the target will not be carried out.

43. Accidents caused by explosions.—Should an explosion cause damage to a weapon, the weapon and batch of ammunition concerned will be preserved intact and a report of the occurrence forwarded through the usual channels to the Chief Inspector of Small Arms.

44. Duties of superintending officers.—Officers will superintend four targets only on the firing point and in the butts.

45. The duties of officers superintending at the firing point are :—

- i. To ensure that the regulations for safety and for the conduct of the practices are obeyed and, where ranges adjoin, that the minimum safety angle is observed according to standing orders.
- ii. To identify the firer with the name given on the firing point register and to detail and vary the order of firing before the beginning of each practice.

- iii. To ensure that men fire with the weapon which has been issued to them and to check the number of the rifle with that entered on the firing point register. This does not apply to officers and others to whom a rifle has not been issued.
- iv. To inspect sights to ascertain that they are used as issued. They may not be blackened.
- v. To ensure that no more than the authorized amount of ammunition is expended by each firer.
- vi. To ascertain that only such coaching as permitted by regulations is allowed.
- vii. To allow each detail one or two "snaps" at the target before loading. No aiming or snapping will take place, except from the firing point.
- viii. To ensure that, where applicable, service bursts of four or five rounds are fired in light machine-gun practices.
- ix. To see that rifles are in the correct positions before beginning practices lying in the open, i.e. loading position for snaphooting and aiming position for rapid.
- x. In battle shooting practices, when applicable, to see that the correct use is made of cover.
- xi. To check that the marking in the butts is carried out according to the regulations and that firers are given an opportunity to see the marking and of entering the results in their record books.
- xii. To collect, check and sign the registers and forward them, together with the firing point registers, to the headquarters of the unit concerned.

46. The duties of officers superintending at the butts are :—

- i. To see that the targets are of the proper dimensions and sufficiently clean to enable shot holes to be easily distinguished, and that all old shot holes are properly patched before practice begins.

- ii. To see that the butts and appliances are in good order and to report any damage or deficiency.
- iii. To explain all regulations and local orders to the markers and to ensure their observance.
- iv. To allow no man to leave the butts without an order. This order will not be given until it has been ascertained personally that the red flag has been hoisted both at the butts and at the firing point. To prevent the red flag being lowered until satisfied that all markers are in the butts.
- v. To detail markers to targets. In grouping practices, one marker at each target should be responsible for noting the order in which shots strike the target and, during other practices, for watching the bank.
- vi. To see that the targets for machine guns, if placed on the stop-butts, are erected to give the best facilities for observation of fire.
- vii. To ensure that no target is lowered without an order. In slow practices, the target will not be lowered until the officer is in front of it. In rapid practices, the target will be lowered to "half-mast" at the end of the time allowed and the markers ordered to stand as far back as possible until the officer is in front of it.
- viii. To cause all targets to be lowered during cessation of fire.
- ix. To regulate the exposure of targets according to the instructions laid down and to ensure that the "value of each hit" is correctly signalled. In snapshooting practices, to ensure that each target is correctly exposed so as to be clearly visible to the firer. Snapshooting targets should be put up straight and not swung sideways.
- x. To check the target of each firer and enter in ink the value of all hits in the register; occasional shots will be entered in the columns provided for the purpose. No erasures will be made. If alteration is necessary, a fine line will be drawn through the figure, the correct value written against it and the amendment vouched for by the officer's initials.

- xi. If more hits, including ricochets, are found on a target than rounds fired, to deduct from the score the value of the highest scoring hits. Only those hits which are to count will be entered on the register. (In the case of the machine gun, see Pamphlet No. 7.)
- xii. To mark off each hit on the target with a red pencil before entering its value in the register and to ensure that all shot holes are correctly patched.
- xiii. In rapid practices, after each check, to cause the number of hits of each value to be signalled on each target.
- xiv. On the conclusion of a practice, to rule a line diagonally across the unused spaces in the register before signing it.

47. Regulations for non-gallery ranges :—

- i. The register (A.F. B 190A), on which all hits or misses will be entered as signalled, will be kept at each firing point by a N.C.O. detailed for the purpose.
- ii. Targets will only be checked on the completion of the rounds allotted in timed practices, after occasional shots or when the number of hits renders marking difficult. The officer on butt duty will signal the warning to cease fire, examine targets, mark off all hits or ricochets and enter their value on A.F. B 67. He will then cause them to be signalled to the officer at the firing point (a marking disc showing the value of each series being placed on the target), who will compare them with the numbers recorded on the register and enter the totals in the spaces provided for the purpose. The hits will then be patched.
- iii. In other respects the regulations for gallery ranges will be observed.

Signalling and Scoring

48. The standard of scoring which follows is given as a guide and will apply, unless otherwise stated in the pamphlets containing the annual range courses. Shots cutting the edge of any ring, rectangle or figure will be counted to the benefit of the firer.

Type of target	Points for score	Method of signalling
Grouping and Application (Rifle)		
Bull's-eye	4	White disc placed on shot hole.
4-inch group (100 yards)	25	
1 " " (25 ")	25	
Inner	3	Black disc waved twice across face of target, and placed with centre on shot hole.
8-inch group (100 yards)	20	
2 " " (25 ")	20	
Magpie	2	Disc revolved in front of target and then placed with centre on shot hole; black side exposed.
12-inch group (100 yards)	15	
3 " " (25 ")	15	
Outer	1	Black disc moved vertically up and down left of target and then placed with centre on shot hole.
12-inch group (100 yards)	10	
1 wide	10	
3-inch group (25 yards)	10	Red and white flag shown on same side as direction of miss. If the direction cannot be determined, the flag will be waved across the face of the target.
1 wide	Nil	
Ricochet, miss or remainder of target not within outer circle		
Grouping (L.M.G.)		
2-inch group (25 yards)	10	
Four shots within ring		
3-inch group (25 yards)	6	
Four shots within ring		
4-inch group (25 yards)	2	
Four shots within ring		
Snapshooting	3*	Target twirled above gallery.
Figure targets	3*	
L.M.G. screens		
Each scoring rectangle containing :—		
1 shot	2	
2 shots	4	
3 " "	6	
4 or more shots	8	

* Variable in battle shooting.

Vickers M.G. application—

Type of target	Points for score	Method of signalling
Application 6 feet	Tables 1 and 2. Each hit on target below and including ten—4 points. Table 2. Above ten—5 points.	
Traversing Application 4 feet	5 points for one hit. 1 point for each additional hit up to maximum of 12 hits.	

NOTES

Rifle groups will be measured with wire rings 4, 8 and 12 inches in diameter. No points will be awarded to a group unless there are five shot marks on the target. If there are more than five shot marks, there will be no score and the practice will be repeated. Where it is found impracticable for the firer to go to the target, groups will be signalled (*see* para. 48) and the position of the M.P.I. shown by placing the centre of the marking disc on it.

In rapid practices, bull's-eyes and inners will score 3 points and will be signalled as bull's-eyes.

Competitions

49. The competitive element is an incentive to weapon training efficiency, provided that it is not carried to excess. Competitions at weapon training meetings should be framed so that they lead to efficiency in battle shooting and should induce the participation of the largest number of entrants possible. Team competitions are preferable to individual events, as they make for the attainment of a good average standard.

50. Competitors should be divided into classes according to their rank, experience and ability. A convenient division is as follows :—

Officers and senior N.C.Os.
 Serjeants and corporals.
 Soldiers, including lance-corporals.
 Young soldiers (say, under 18 months' service)

or

Marksmen or service (or qualified) shots.
 Recruits.

Team competitions should be based on the war organization of units and the "packing" of teams should be prevented as far as possible.

Programmes should embrace all weapons and, to prevent undue practice beforehand, they should not be published until a few days before the meeting.

Prizes should be many and small rather than few and large.

Prizes—Details of Awards

51. The grants allowed by the Pay Warrant for issue as weapon training prizes to non-European units of engineers and infantry, in which proficiency pay is not admissible, will be awarded as follows:—

- i. Grant (a) will be drawn for all recruits (except officers) who complete the Recruits' Course and will be awarded to the best shots of each party as the C.O. may deem desirable.
- ii. Grant (b) will be drawn for all ranks (except officers and warrant officers) who have completed the classification or qualification practices prescribed for trained soldiers. It will be awarded in accordance with a scheme which will be prepared by the C.O. at the beginning of the weapon training year and will be submitted for the approval of the G.O.C.-in-C.
- iii. All those in respect of whom money is drawn will be eligible to receive prizes, but serjeants should compete separately and not with the rank and file.
- iv. A.F. O 1716 will be prepared, in triplicate, and forwarded for the approval of the G.O.C.-in-C. When approved, two copies will be returned to the unit, one for retention and the other for transmission with the pay list in which the prizes are charged against the public. The awards will be notified in orders.
For forfeiture of prizes, see the Pay Warrant.

Returns and Records

52. The following is a list of weapon training returns, records, registers, etc. Full particulars and directions for compiling them are contained on each form.

Records of ammunition expenditure will be entered in A.B. 99 on each day that firing takes place, and A.F. B 159 and 159A will be completed.

REGULAR ARMY.

A.F. B 159.	}	Inspection of Arms and Equipment.
„ B 159A.		Recruits' Weapon Training Return.
„ B 188.		Company Annual Return, Cavalry and Infantry.
„ B 192.		Company Annual Return, Arms other than Cavalry and Infantry.
„ B 192A.		Regimental Annual Return.
„ B 187.		Transfer Return.
„ B 193.		Register of Judging Distance Tests.
„ B 186.		Firing Point Register.
„ B 189.		Butt Register.
„ B 190.		Machine-Gun Firing Point Register.
„ B 2050.		„ „ Butt Register.
„ B 2050A.		Annual Machine-Gun Course Return.
„ B 192M.		Record of Ammunition Expended.
A.B. 99.		

TERRITORIAL ARMY.

A.F. E 552.	Company Annual Return.
„ E 569.	Regimental Annual Return.
„ E 570.	Machine-Gun Regimental Annual Return.

Regimental, company and recruits' annual returns and records of all tests will be retained for three years. All other returns and records, including B 186, may be destroyed at the end of the weapon training year, on the authority of the G.O.C.-in-C.

Regimental returns will be forwarded through the usual channels to command headquarters at the end of the weapon training year.

Badges

(See Clothing and T.A. Regulations)

53. Regular Army. Light Machine Gun and Snipers.

—Good shooting badges will be awarded annually at the discretion of C.Os., who will take into account the all-round shooting capabilities of the individuals. They will be worn as laid down in Clothing Regulations and will be issued as soon as possible after they have been won.

The names of those entitled to wear them will be published in unit orders.

Where a marksman in either rifle or light machine gun is also entitled to a company or battalion badge, the highest only will be worn.

They will be awarded as follows :—

- i. The best combined rifle and light machine-gun shot in each company, etc. (Star and crossed rifles.)
- ii. The best combined rifle and light machine-gun shot amongst serjeants and lance-serjeants in the battalion, etc. (Crown and crossed rifles in wreath.)
- iii. The best combined rifle and light machine-gun shot amongst corporals and privates in the battalion, etc. (Star and crossed rifles in wreath.)

Personnel in H.Q. company are eligible for the company, etc., badge under such conditions as C.Os. may decide, provided in each case that they have qualified as marksmen.

Badges for marksmen with the light machine gun (L.G. in wreath) and rifle (crossed rifles) will be issued to soldiers below the rank of Warrant Officer, Class I, in accordance with the conditions laid down in the annual course. Personnel at depots may wear the badges, won in their unit, during their tour of duty, provided that they qualify in the annual course fired at the depot.

54. Territorial Army. Rifle and Light Machine Gun.

—Badges will be issued according to scores to :—

- i. First class rifle shots. (Single rifle.)
First class light machine-gun shots. (L.G.)
- ii. The rest rifle shot in each company, etc. (Rifle and star.)
The best light machine gun shot in each company, etc. (L.G. and star.)
- iii. The best rifle shot in each regiment or battalion. (Rifle and crown in wreath.)
The best light machine-gun shot in each regiment or battalion. (L.G. and crown.)

55. Regular Army. Machine Gun.—A badge for the best machine gunner amongst lance-corporals and privates in each company, etc., will be issued at the discretion of the company commander. (Star and M.G. in wreath.)

The marksmen's badge will be issued to lance-corporals and privates according to their scores in the annual machine-gun course. (M.G. in wreath.)

The range-taker's badge will be issued to corporals, lance-corporals and privates if qualified 1st class in the annual range-taking test. (R. in wreath.)

56. Territorial Army. Machine Gun.—Badges will be issued to :—

- i. The best lance-corporal or private in the machine-gun company according to score in Part II of the annual course. (Star and M.G.)
- ii. 1st class badges will be issued to lance-corporals and privates who qualify as 1st class gunners in Part II of the annual course. (M.G.)

Metal Fund

57. An account for the sale of metal recovered from rifle ranges will be kept in each command. Metal will be collected from the butts daily by range wardens. Troops will not be employed for this work, except in ranges in barracks. Arrangements for the collection, safe storage, despatch and sale of the metal will be made by headquarters of commands. The best price possible should be obtained, and a guide to value may be found in the Woolwich price list of old metal. Metal may be returned from stations abroad to Woolwich Arsenal in certain circumstances (see Regulations of Army Ordnance Services, Part 1).

Money obtained from the sale of metal will be used for the payment of range wardens for the work of collection, for prizes and the payment of markers at rifle meetings and for the preparation of ground for field firing, but not for the purchase of ammunition.

The accounts will be forwarded on A.F. N 1472 at the end of the financial year to the army auditor or, where a local audit office does not exist, to the War Office.

APPENDIX I

ZEROING AND TESTING

ZEROING

1. Before the annual course is fired and at any other time when considered necessary, weapons will be zeroed to ensure that the sighting is true for direction and elevation. A useful method of ascertaining the number of weapons that will require zeroing is to fire a *grouping* practice at 100 yards. Provided that a good group is obtained, any adjustment that may be necessary to the sighting will be indicated by the position of the *mean point of impact* in relation to the point of aim.

Vertical errors are corrected by fitting a different foresight and lateral errors by movement of the foresight on the block. A weapon should never be left with a remaining lateral error. Any alterations will be made by the armourer-serjeant, who must be present when zeroing or testing is in progress.

Records of zeroing will be made for the rifle in the soldier's record book and for light machine guns in the gun history sheet, or both. Any remaining vertical error after adjustment will also be noted so that the necessary allowance can be made by the firer at each distance.

All light machine-gun barrels should be zeroed.

2. The general conditions under which zeroing will be carried out, for all weapons, are :—

i. Examination before test.

Weapons must be examined by the armourer before test, to ensure that all screws are tight and that the barrel is not influenced by the fore-end in the case of the rifle.

ii. Weather conditions.

Good shooting light and the calmest available weather conditions must be chosen.

iii. The bore must be dry and clean and warmed by firing into the stop-butt before making the group. (Rifles, 2 rounds. Light machine guns, 5 rounds.)

iv. Sights will be set at :—

200 yards for the rifle. (Windgauge, if any, to be central.)

200 yards for the light machine gun.

v. Range.

Rifle and light machine gun. 25 yards from foresight to target is the most suitable range.

100 yards may be used as an alternative, atmospheric conditions permitting.

vi. Position.

Rifle. Lying. Forearm and wrist rested (not the rifle).

Light machine guns. Lying, bipod on firm ground.

vii. Targets.

Rifle and light machine gun. At 25 yards a representative target (Small 200/25), which must be fixed upright, or a plain white screen with a 1-inch black aiming mark.

At 100 yards (rifle only) 4-foot target with a white patch on the aiming mark.

viii. Sighters.

Sighting shots may be fired, as required, in zeroing the .303-inch Vickers machine gun.

ix. Stoppages.

If a stoppage occurs, the group will be repeated.

x. Wind allowance.

Aim must be taken at the aiming mark, the necessary deflection being previously found by a known straight-shooting weapon or by estimation.

3. Conditions particular to the various weapons and the standards of grouping are as follows :—

i. Rifle.—The backsight ramps are curved to give the correct increases in elevation for longer ranges, provided that the rifle is correctly sighted at 200 yards, i.e. the shot will strike the point of aim approximately at that range.

A group of five shots will be fired by a skilled firer, taking the same point of aim for each shot. Groups will be repeated after any adjustment of the foresight in order to verify.

The permissible variation in the mean point of impact for a rifle correctly sighted is given in the table below. Alterations to the position and/or size of the foresight will be made until the weapon groups to the standard given.

There are seven sizes of foresight available for adjustment of vertical errors. The difference of one size gives the following alterations to the M.P.I.

At 100 yards, 2.77 inches or approx. 3 inches rise or drop on the target.

At 25 yards, 0.69 inches or approx. $\frac{3}{4}$ -inch rise or drop on the target.

Actual distance between firer and target	Sight adjustment	Correct position of M.P.I. with reference to aiming mark	Permissible variation in position of M.P.I. from correct point
100 yards	200	Approx. 3 inches directly above centre of lowest edge.	Not exceeding 2 inches above or below.
25 yards	200	Approx. $\frac{3}{4}$ inch directly above centre of lowest edge.	Not exceeding $\frac{1}{2}$ inch above or below.

ii. Light machine guns.—A skilled shot will fire five single rounds. The table below shows the permissible variation in the M.P.I. for a light machine gun.

There are three sizes of foresight available for adjustment of vertical errors. The difference of one size gives the following alterations to the M.P.I.

At 100 yards, 3.48 inches or approx. $3\frac{1}{2}$ inches rise or drop on the target.

At 25 yards, 0.87 inch or approx. $\frac{7}{8}$ -inch rise or drop on the target.

Actual distance between firer and target	Sight adjustment	Correct position of M.P.I. with reference to aiming mark	Permissible variation in position of M.P.I. from correct point
100 yards	200	Approx. 3 inches above centre of lowest edge.	Not exceeding 3 inches above or below.
25 yards	200	*Approx. 1 inch to right of centre of lowest edge.	Not exceeding $\frac{3}{4}$ inch above or below.

iii. .303-in. Vickers machine gun.—Lateral adjustment of foresight. Range 25 yards (see Handbook of Vickers Machine Gun, 1930, page 130).

iv. Any weapon that in the hands of a skilled firer fails to make a good group will be tested.

* Lewis gun approximately centre of lowest edge.

TESTING

4. The conditions for testing will, when applicable, be as for zeroing (see para. 2). The results of tests with all relevant details will be recorded on A.F. B 202 and forwarded to the Chief Inspector of Small Arms, Enfield Lock, if the standards given hereinafter are not reached.

5. A group of single shots will be fired in rifle tests, but, in order to distinguish between inaccuracy due to the barrel and inaccuracy due to some defect in the gun, Vickers guns and light machine guns will be subjected first to a barrel test and then to a complete gun test.

6. *Vickers .303-in. M.G. and light machine guns, barrel test.*—A skilled shot will fire ten single shots, carefully relaying the gun and taking the same aim for each shot. In bringing the sights of the Vickers gun on to the mark, the gun will be elevated on each occasion so that any play in the elevating gear will always be taken up in the same direction.

At 400 yards range all shots must fall within a square of 24-inch sides.

Barrels will be exchanged if they fail to reach this standard, provided that a satisfactory group is obtained with a known good barrel with the same gun and tripod.

7. General Instructions :—

i. The exact position of the shot holes will be measured to one place of decimals horizontally and vertically from the left and bottom edges of the target respectively, except for tests of the .22-inch rifle, when the targets used will be forwarded with A.F. B 202.

ii. Shots will be recorded in the order in which they are fired in the test of rifles.

iii. If any shots are not on the target, groups will be repeated once, any suitable alteration of aim being made for direction and elevation. If the alteration fails to bring all the shots on to the target, the fact will be recorded on A.F. B 202.

iv. A check group will be fired, by the same firer and with ammunition from the same batch, with a weapon known to be reliable. The results will be recorded on A.F. B 202.

v. Tests of complete .303-in. Vickers machine guns will be carried out with a known good barrel.

8. **Details and individual weapons.**—The details for the various weapons and the standard of grouping are given in the table below :—

Weapon	Number of rounds and method of firing	Range	Size of rectangle containing the group measured horizontally and vertically		Permissible distance of M.P.I. from point of aim
			yards	inches	inches
Rifle	10	200		8	8
Light machine gun	3 groups, each of 10 rounds, fired in service bursts	200		24	24
		25		3	3
.303-inch Vickers machine gun	3 groups, each of 10 rounds, fired in one burst	400*		36	36
		25		2½	2½
Rifle No. 2. .22-inch	2 groups, each of 5 rounds	25		1½	1½

* For convenience, the test and barrel test may be fired at 200 yards, the passing limits being reduced proportionately.

APPENDIX II

COACHING

PART I

1. Object of range practices.

- Range practices are the advanced stage of elementary training which precede service shooting.
- To give a firer confidence in his rifle and his ability to become a practical service shot.

2. Need for efficient firing point instructors.

- To gain the necessary confidence the young soldier must shoot well on the range.
- Therefore, to help the firer to obtain good results, he is provided with a *coach*.

3. Knowledge essential to efficient coaching.

- Powers and limitations of rifle and ammunition combined.

- Powers and limitations of rifle, ammunition and firer combined.
- Study of firer's temperament and harmony with firer.
- Encouragement.

Some of the causes of inaccurate shooting

Causes within the firer's control

- Faults in aiming, such as inclined sights, dwelling too long in the aim, failing to maintain elevation when aiming off for wind.
- Faults in trigger pressing, for example not taking the first pressure correctly, or snatching the trigger instead of squeezing.
- Faults in position, body and elbows incorrect, eye too close to the cocking piece, left wrist and forearm (or rifle) incorrectly rested.
- Faults in the rifle, wrong bolt or bayonet, cord wear, loose butt or screws due to carelessness.
- Faults in the firer, incorrect breathing, gun shyness, overkeenness, untruthful declarations, lack of determination, and preventable physical unfitness.

Causes outside the firer's control

- Difficult atmospheric conditions such as bad light, mirage, strong or variable winds.

- Faults in the rifle—sights in need of browning, either incorrectly zeroed or not zeroed, butt not fitting the firer, worn chamber or barrel, nickeling in bore, loose screws due to vibrations of firing.

- Faults in firer, defective eyesight, unavoidable illness, inadequate preliminary instruction.

- Faults in coaching—inexperienced coach, impatience on the part of the coach, too much "hustle."

vi. Coaching is an art. There are no fixed rules, only guiding principles. Steady perseverance, great patience and a great deal of practice are required to master the art.

vii. A coach must understand that *grouping is the foundation of all shooting*. It is on a man's capacity to group his shots round a mark that his ability to apply his fire to any given target will depend.

4. Powers and limitations of rifle and ammunition alone.

- i. All rifles are tested at the factory under conditions which ensure the greatest accuracy.
- ii. Rifles before issue must group to $1\frac{1}{2}$ inches by 1 inch at 100 feet, i.e. $4\frac{1}{2}$ by 3 inches at 100 yards.
- iii. Ten per cent. of rifles before issue must group to 2 feet at 600 yards.
- iv. Show the above-mentioned dimensions by diagram.

5. Demonstrate and explain.

- i. What is meant by a "group."
- ii. That this group is the measure of the capacity of the rifle and ammunition combined.

6. Powers and limitations of rifle ammunition and firer combined.

- i. When the rifle is fired by a man alone it will be appreciated that the resulting group is unlikely to be smaller, if as small, as that obtained at the factory.
- ii. Therefore, with the S.M.L.E. rifle and Mark VII ammunition and fired by the man alone, the smallest area which will contain all his shots is taken to be a 4-inch circle at 100 yards, provided that all shots are fired accurately.
- iii. It follows that the worse the firer the larger the area that will contain his shots.
- iv. In this case the group is the measure of capacity of the rifle, ammunition and firer combined.
- v. Show the three sizes of group measuring rings (4-inch, 8-inch and 12-inch) which are used for measuring the grouping capacity of firers at 100 yards.

7. Demonstrate, with group measuring rings :—

- i. The grouping capacities of the 4-inch, 8-inch and 12-inch groupers at 100 yards when firing at 200, 300, 400 and 500 yards.
- ii. Explain that the main object of preliminary instruction before firing the annual course is to improve a man's grouping capacity.
- iii. That the average size of a man's group obtained in preliminary instruction provides his coach with valuable information when coaching him in application practices.

iv. Therefore, all such groups must be carefully recorded in the firer's record book (A.B. 142).

v. Men who fail to reach a 12-inch grouping standard at 100 yards are not fit to fire application practices on the open range.

vi. Once the size of a man's average group is known, the area at any range which should contain all his shots is also known.

For example.

A 4-inch grouper at 100 yards firing at 200 yards, shots will be contained in 8-inch circle.

A 4-inch grouper at 100 yards firing at 300 yards, shots will be contained in 12-inch circle.

A 4-inch grouper at 100 yards firing at 500 yards, shots will be contained in 20-inch circle.

The same applies proportionately to the 8-inch and 12-inch groupers at these ranges.

vii. The above principles are equally true for the firers who can group their shots into areas lying between the three standard sizes of groups.

For example. A man who normally groups to 6 inches at 100 yards will know that at 300 yards he can expect an 18-inch group.

viii. In addition to knowing a man's *normal* group, the coach must know the position of the centre or M.P.I. of the group. This he can obtain from the soldier's record book and from the man himself.

ix. If correctly sighted and the rifle is fired accurately with the sights set exactly at 200 yards the correct position of the M.P.I. of the group will be :—

At 200 yards ...	...	...	Central to point of aim.
At 100 yards ...	...	...	3 inches high to point of aim.
At 25 yards ...	...	...	$\frac{3}{4}$ inch " " "

Show, using 4-foot and representative target (200/25).

x. If it is known where the M.P.I. of a group, fired from an accurately sighted rifle, should be, it is an easy matter to alter the sighting of any rifle which is found to be shooting inaccurately. This is zeroing.

8. Demonstration of coaching when firing a grouping practice on the open range.

- i. Object. To show how to coach a grouping practice on the open range.

- ii. Imagine that firing is on the 100 yards firing point.
- iii. Show the position of each shot, using spotting discs, as it arrives on a 4-foot target. (Diagram No. 1.)

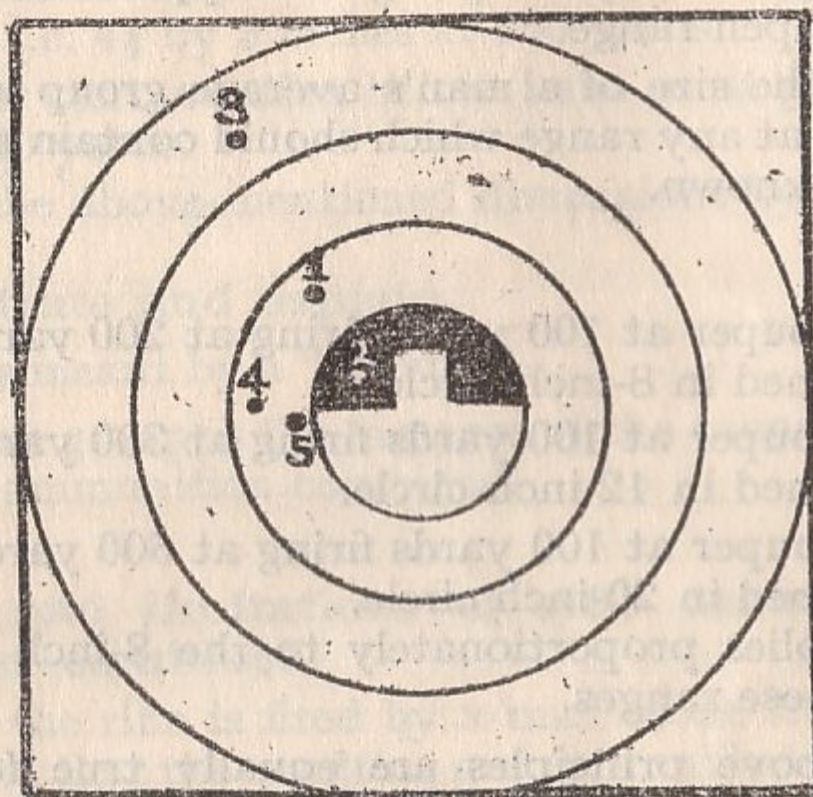


DIAGRAM No. 1

- iv. Point out actions of coach before the practice begins.
(Inspection of rifle. Examination of record book to find out firer's grouping capacity and position of M.P.I. of previous groups. Allot target and explain practice to firer.)
- v. Stress the following actions of the coach during the practice.
Same position as firer but does not touch firer.
Watches firer carefully for holding, breathing, trigger pressing, flinching and lack of determination.
Checks faults while firer rests.
Notes firer's declaration in record book or on representative target.
- vi. Demonstrate coach's examination of group after the practice.
 - (a) Comparison of order of arrival of shots with firer's declaration.
 - (b) Size of group for scoring purposes and entry of the necessary details in the firer's record book.
 - (c) Size of group for coaching purposes.
 - (d) Discuss position of M.P.I. of group as regards direction and elevation.
 - (e) Point out how pattern of group is regular and discloses no error.

- vii. Stress encouragement given by the coach, the fact that, owing to truthful declarations by the firer, he can be credited with an 8-inch group for coaching purposes, and the necessity for efficient marking in the butts. How the firer must be careful to avoid wide shots which spoil, for scoring purposes, an otherwise good group.

9. Zeroing.

- i. The position of the M.P.I. of the group just fired discloses an error in direction of 6 inches left. It transpires that this is due to an error of $1\frac{1}{2}$ inches left remaining on the rifle after zeroing.
- ii. Stress that this is a case of inefficient zeroing.
- iii. Explain that the first call on the C.O.'s pool is for zeroing, and the importance of zeroing rifles accurately.
- iv. Show on a 4-foot target how a 4-inch and a 12-inch grouper are affected by this error of 6 inches left at 100 yards, using the appropriate measuring rings for 200, 300, 400 and 500 yards.
- v. Explain that in each instance the centre of the measuring ring represents the M.P.I. of the group.
- vi. Emphasize how the good shot is more handicapped by this inaccurately zeroed rifle than the poor shot and how, when engaging a small target in battle shooting or an unsignalled practice such as rapid, the good shot may get no fire effect, whereas the poor shot may obtain some.

PART II

10. Application.

- i. The term denoting the soldier firing each shot up to his best capacity and trying to keep the M.P.I. of his group or cone of fire on the centre of the target.
- ii. With each shot, if it is well fired, the firer engages the target with his cone of fire, which is the same size as his normal group for that particular range.
- iii. Demonstrate with measuring rings on a 4-foot and 6-foot target the area on the target which will contain the cone of fire of an 8-inch grouper at 100 yards firing at 300 yards, and a 4-inch grouper at 100 yards firing at 500 yards, provided that each man is firing up to his normal grouping standard.

iv. It is only reasonable to assume that a rifleman firing single shots will obtain a better group than the light machine gunner, who obtains a burst of penetrations almost simultaneously by one pressure of the trigger, both weapons being shoulder controlled.

A light machine gunner, firing with the same accuracy, and who can group to 4 inches at 100 yards with the rifle would find when firing service bursts with the L.M.G. that his group at 100 yards would be about 8 inches. When firing single rounds from the L.M.G. he should obtain a 4-inch group at 100 yards.

11. Demonstration to show how intelligent coaching helps a firer.

Object. To illustrate the principles of coaching and to show that good results can only be obtained when information given by grouping practices is intelligently used in application practices.

[NOTE.—It will be appreciated more easily if the harm that can be done by bad coaches is compared with the good done by well-trained coaches.]

1. PART I. The wrong way.

- The coach is an intelligent and keen N.C.O., but does not understand the connection between grouping and application.
- The firer is a 12-inch grouper at 100 yards and is firing an application practice at 300 yards. (Diagram No. 2.)

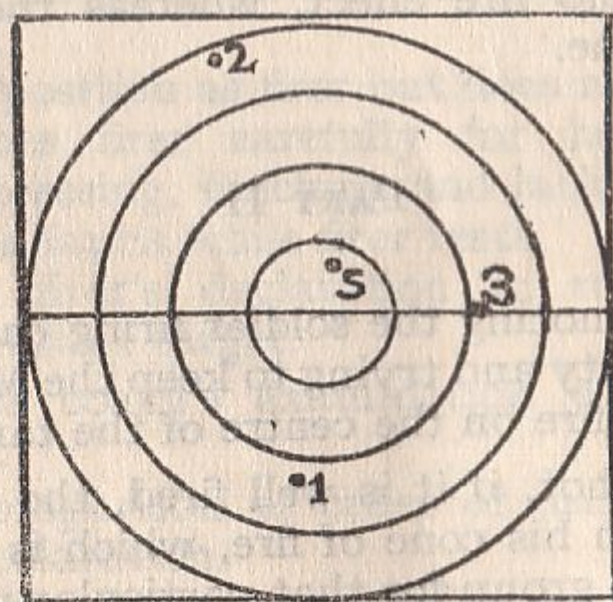


DIAGRAM No. 2

iii. The following was the coach's advice :—

- | | |
|--------------|--|
| 1st shot ... | Sights at 300 yards. |
| 2nd shot ... | Sights up to 450 yards, thus raising the M.P.I. $1\frac{1}{2}$ feet. |

3rd shot ... Sights down to 300 yards.

4th shot ... Aimed off to second point of aim to the left, thus moving the M.P.I. about 15 inches left.

5th shot ... Aims central.

iv. Discuss each shot in turn, and with aid of measuring rings show how the centre of the firer's group was moved and the effect on the position of each shot as a result of the advice given by the coach.

v. Comment on :—

Score obtained.

Who claimed credit for the last shot.

Encouragement given the firer.

Confidence of firer in his coach.

Confidence of firer in himself and his rifle.

vi. The whole trouble was that the coach did not realize from his study of the firer's A.B. 142 that the man is a 12-inch grouper at 100 yards and was shooting up to his best capacity and applying the centre of his group to the centre of the target. No alteration in elevation should therefore have been advised.

2. PART II. The right way.

- Explain that the same practice is going to be repeated by the same firer, but that this time the coach is well trained and understands the principles involved.

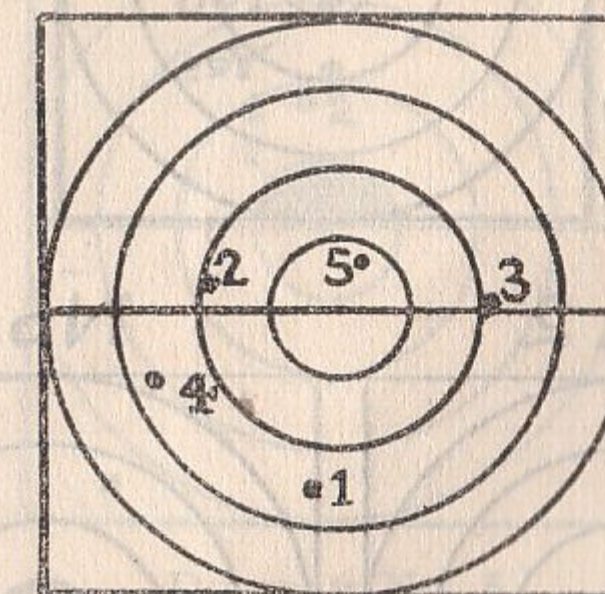


DIAGRAM No. 3

- Compare the result of the two shoots shot by shot, bringing out how the coach did not allow the sights to be altered so long as the shots were inside the firer's normal grouping capacity, and the M.P.I. of the group was falling on the centre of the target. (Diagram No. 3.)

- iii. Discuss the points brought out in para. 1, v, above, and emphasize in addition the realization by the coach of marked signs of improvement in grouping capacity on the part of the firer, and how the coach explained to the man the principles in connection between grouping and application at the end of the practice.
- iv. Stress how this system of coaching becomes useless unless the firer truthfully declares each shot.

12. Alteration of sights.

- i. Discuss and show by demonstration when alteration in sighting elevation should or should not be made during application practices.
- ii. Using three 4-foot targets, explain that a 4-inch grouper at 100 yards is firing on No. 1 Target, an 8-inch grouper on No. 2 and 12-inch grouper on No. 3, and that spotting discs represent the first and subsequent shots fired by each man. Each firer is firing at 300 yards. (Diagram No. 4.)

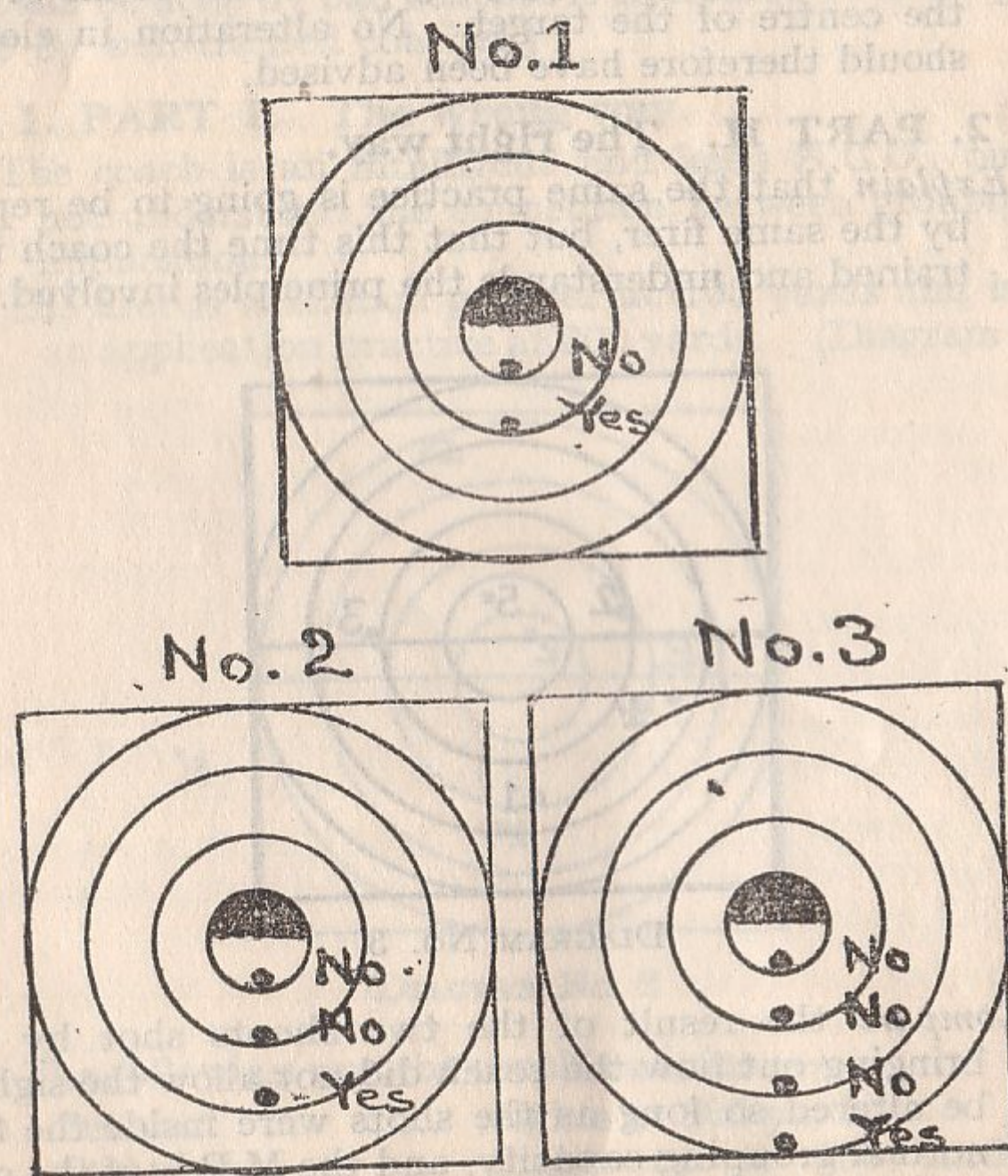


DIAGRAM No. 4

- iii. Take as an example No. 1 Target.

(a) First shot. Any alteration? No, because the shot lies within the minimum area expected from this firer at this range. The position of the firer's group is where it should be, i.e. central.

(b) Second shot. Any alteration? Yes, because the shot was observed to have been correctly fired and the shot was declared "correct."

Therefore, it is probable that this shot was up to the firer's normal grouping standard. Thus, if it is inside the area to be expected at 300 yards from a 4-inch grouper at 100 yards, the "area" itself must be low. Therefore, more elevation is necessary.

(c) Mention how shots which are declared incorrect or to have been fired in a doubtful manner must be ignored, and again stress the need for truthful declarations.

- iv. Deal with first and subsequent shots on Nos. 2 and 3 Targets similarly.

13. Problem.

- i. Using a 4-foot target and spotting discs, show the first and second shots fired by an 8-inch grouper at 100 yards firing at 300 yards (see diagram No. 5).

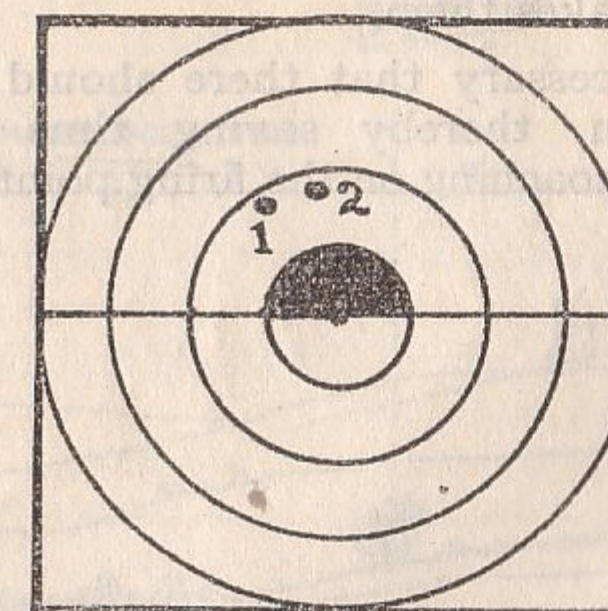


DIAGRAM No. 5

- ii. Both shots are observed to have been well fired and have been declared "correct."
- iii. Should any alteration in sighting elevation be made?
- iv. In order to apply the principles already demonstrated no alteration should be made.

- v. It must be remembered, however, that there are no rules in coaching, only guiding principles.
- vi. In this case, the coach's knowledge of the firer and his own experience may influence him in suggesting an alteration in sighting elevation to lower this firer's group on the target.
- vii. The coach might be right in altering, or better results might be obtained by adhering to the principles of coaching.
- viii. The coach must decide:—

(a) Are they central shots of a group forming high, or are they high shots of a group forming in the correct place?

(b) Remembering that it is impossible to predict the spot within the 24-inch circle which each bullet will strike, it might be a coincidence that these two shots are together, and therefore they may be high shots of a group forming centrally.

(c) If this is what is happening in the case of these two shots, then any alteration in sighting elevation would be risky.

14. Conclusion.

- i. Good coaching eliminates many bad shots, but bad coaching makes them.
- ii. It is very necessary that there should be good range organization, thereby saving time which can be devoted to coaching on the firing point.

APPENDIX III

USE OF LANDSCAPE TARGETS AND HARMONIZED SIGHTS

(Miniature and 30-yard ranges)

1. Landscape targets.—The frame for these is 10 feet long and 5 feet high. Landscapes in sheets, 5 feet by 2 feet, are

BLANK SKY SCREEN

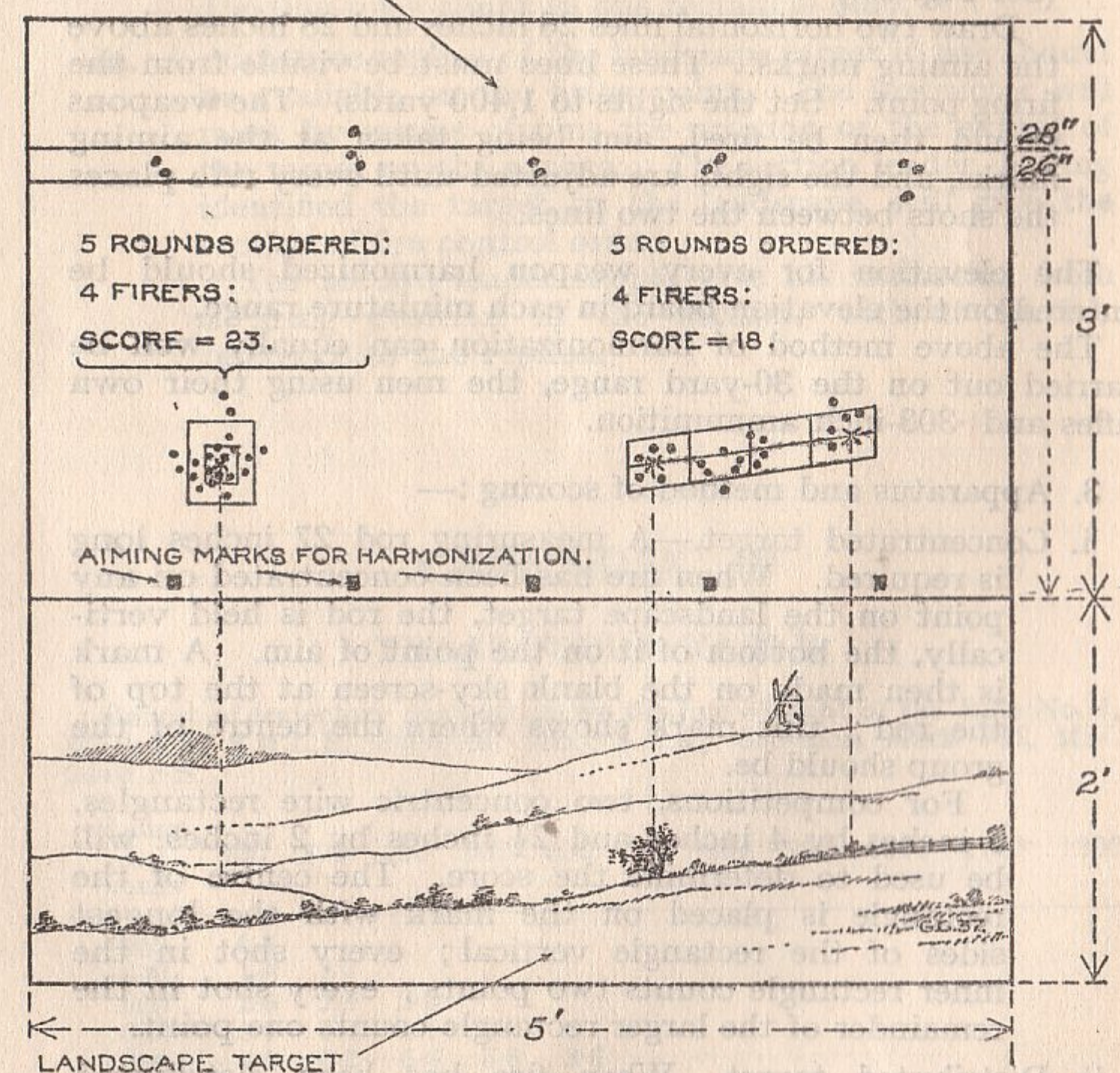


FIG. 19.

pasted on to the lower portion, leaving 3 feet of blank sky-screen above to receive the shots.

The sky-screen should be of brown paper, in order to render the bullet holes invisible to the firers. (See also S.A.T., 1931, Vol. V, Sec. 47, 8.)

2. Harmonization of sights.—In firing at landscape targets, weapons should be given extra elevation, so that the bullets will strike the blank sky-screen, even if the aim is taken at an object at the bottom of the landscape; this necessitates the weapons being harmonized, so that they will all shoot to the same height above the point aimed at. This is carried out as follows:—

Put aiming marks at intervals of about 12 inches on a horizontal line at the bottom of the blank sky-screen. (See Fig. 19.)

Draw two horizontal lines 26 inches and 28 inches above the aiming marks. These lines must be visible from the firing point. Set the sights to 1,400 yards. The weapons should then be fired, aim being taken at the aiming marks, and the sights are adjusted until every rifle places the shots between the two lines.

The elevation for every weapon harmonized should be entered on the elevation board in each miniature range.

The above method of harmonization can equally well be carried out on the 30-yard range, the men using their own rifles and .303-inch ammunition.

3. Apparatus and method of scoring:—

i. Concentrated target.—A measuring rod 27 inches long is required. When fire has been concentrated on any point on the landscape target, the rod is held vertically, the bottom of it on the point of aim. A mark is then made on the blank sky-screen at the top of the rod; this mark shows where the centre of the group should be.

For competitions, two concentric wire rectangles, 5 inches by 4 inches and $2\frac{1}{2}$ inches by 2 inches, will be used to determine the score. The centre of the rectangle is placed on the mark with the longest sides of the rectangle vertical; every shot in the inner rectangle counts two points; every shot in the remainder of the larger rectangle counts one point.

ii. Distributed target.—When fire has been distributed between two points on the landscape, a mark is made 27 inches vertically above each, as already described; these two marks are joined by a line parallel to that along which fire has been distributed.

This line is then produced $1\frac{1}{2}$ inches beyond the marks at either end. A line $1\frac{1}{2}$ inches above and another $1\frac{1}{2}$ inches below are drawn parallel to the first line. The ends of these are joined by vertical lines passing $1\frac{1}{2}$ inches outside the two marks and the parallelogram thus made is again sub-divided into equal spaces, one for each firer (see Fig. 19). The extra $1\frac{1}{2}$ inches at each end is to allow for the width of the cone of fire of the two flank men of the section.

All shots in the rectangle opposite the particular firer (up to the number of rounds given in the fire control order) count one point each to the total score of the section; any shot in a rectangle over and above the number ordered will not count. Shots on the dividing lines count in one rectangle only.

iii. A miniature replica of the landscape target in use should be available on the firing point. The instructor will mark by means of pins the position or the extent of the target on the replica. The section leader, having identified the target on the landscape, will give the section of fire control order.

The section leader should give his indication from a firing position in the section, without further reference to the replica.

APPENDIX IV

TRAJECTORY TABLE

Height of trajectory (in feet) above the line of sight of the Rifle No. 1, Mark III, S.M.L.E. .303-inch, firing S.A.A., .303-inch, Mark VII, M.V. 2440 F.S.

Range in yards	200	300	400	500	600	700	800	900	1000	1100	1200
300	0.7										
400	1.6	1.4									
500	2.6	2.9	2.0								
600	3.7	4.4	4.1	2.6							
700	4.9	6.2	6.6	5.8	3.6						
800	6.3	8.3	9.4	9.4	7.9	4.8					
900	7.9	10.7	12.6	13.3	12.6	10.3	6.2				
1000	9.7	13.4	16.2	17.8	18.0	16.5	13.2	7.8			
1100	11.7	16.5	20.3	22.9	24.1	23.7	21.3	17.3	10.5		
1200	14.0	19.9	24.8	28.5	30.9	31.7	30.7	27.5	21.9	12.5	

RANGE TABLE

FOR RIFLES FIRING S.A.A., .303-INCH, MARK VII, WITH A MUZZLE
VELOCITY OF 2440 F.S.

Range	Angle of tangent elevation	Angle of descent
yards	deg. min.	deg. min.
200	0 7	0 9
300	0 11	0 15
400	0 16	0 22
500	0 22	0 30
600	0 28	0 40
700	0 35	0 52
800	0 43	1 7
900	0 52	1 25
1000	1 2	1 46

For data beyond these distances, see .303-inch Vickers machine gun tables.

APPENDIX V

RECOGNITION OF AMMUNITION

In order that the various types of boxes for ammunition (small arms) in use in the Army may be recognized by day and night, distinguishing marks will be placed on them.

Officers and other ranks who have to handle and issue such ammunition will make themselves acquainted with these markings, which are as follows :—

Type of ammunition (1)	Method of packing (2)	Distinguishing marks on end of box (3)
.303-in. (Mk. VII)	Bandolier	Plain ends—Brown colour.
"	Cartons	Battens each end—Green colour.
"	Stripless belt	" V " shaped batten at each end.
"	Cases charger	Raised " CC ".
" (A.P.)	Cartons	Raised " W ".
" (Incendiary)	Cartons	Raised " B ".
.5-in. (11 Z)	Cartons	Raised " 5 ".
" (A.P.)	Cartons	Raised " 5.W ".
.55-in. (A.P.)	Bandoliers	Raised " 55.W ".
1-in. (Illuminating) (J.11.T)	Bundles	Raised " 1.J. ".

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